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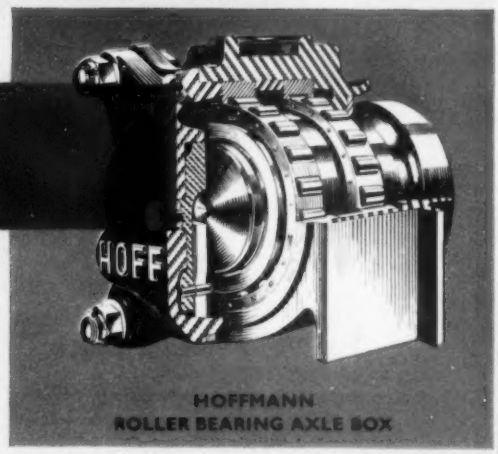

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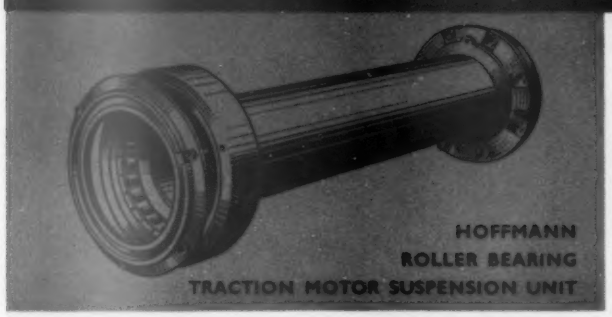
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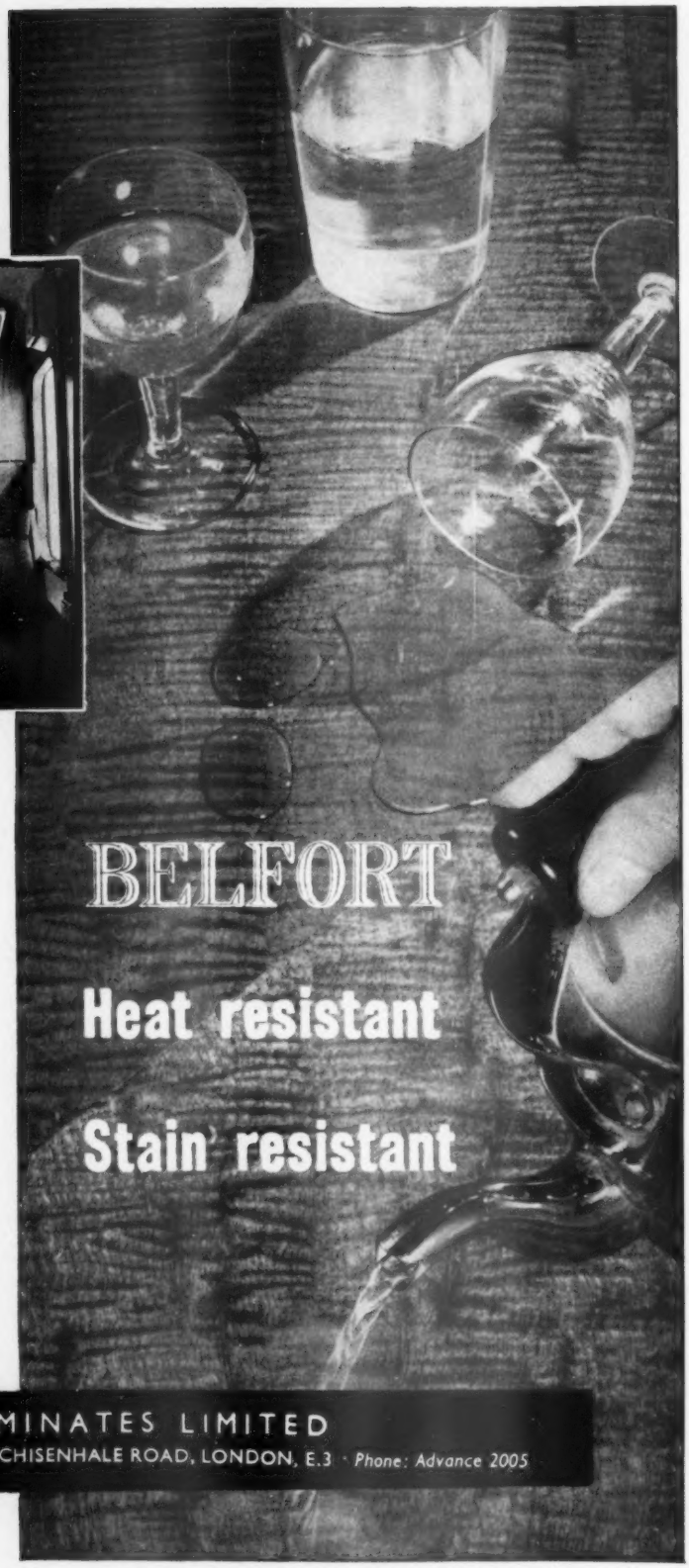

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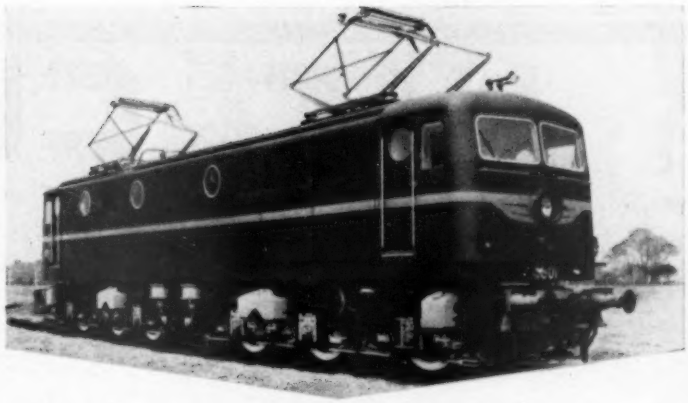
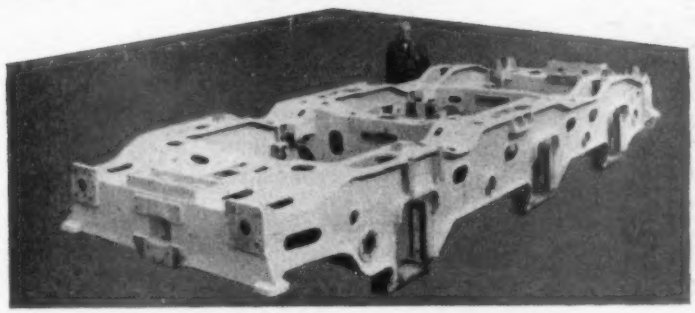


A.E.I. 3820 h.p. electric locomotive for New South Wales Government Railways built by Metropolitan-Vickers Beyer, Peacock, Ltd.

A sound foundation for electric transport



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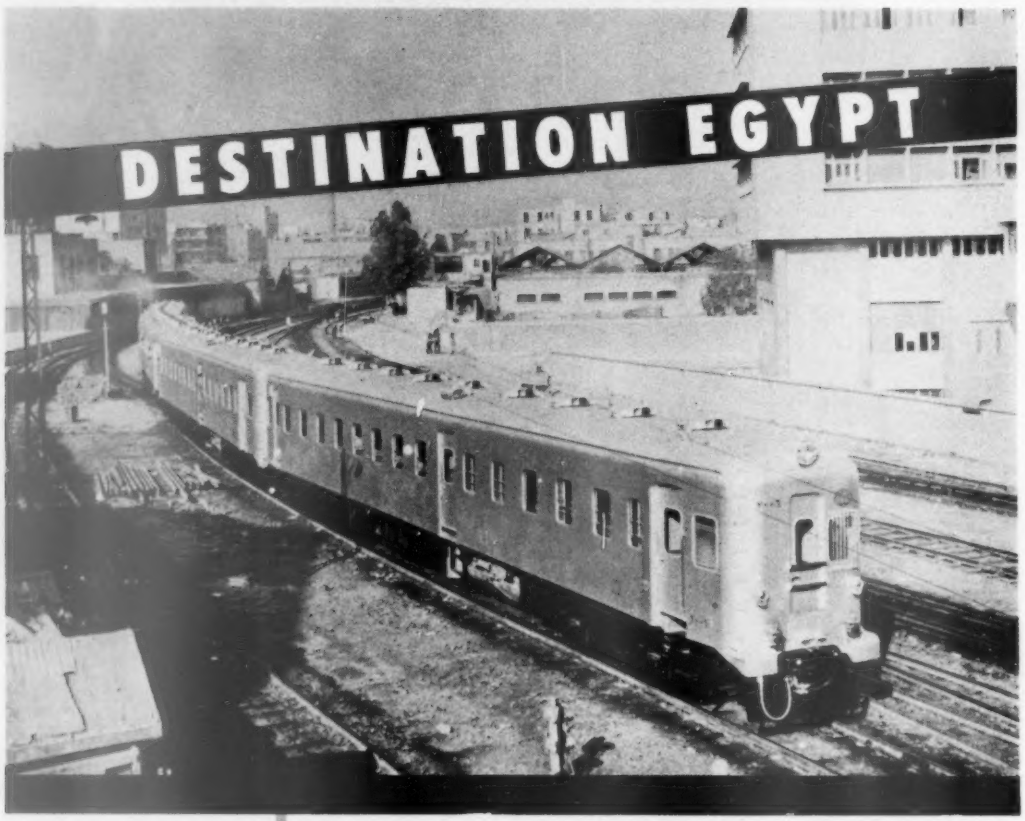

1. Gauge of track .....
   4 ft. 8½ in. (1,435 mm.)
2. Seating capacity —
   2nd class..... 24 seats
   3rd class..... 100 seats
3. Tare weight .....approx. 45 tons
4. Leading dimensions.....
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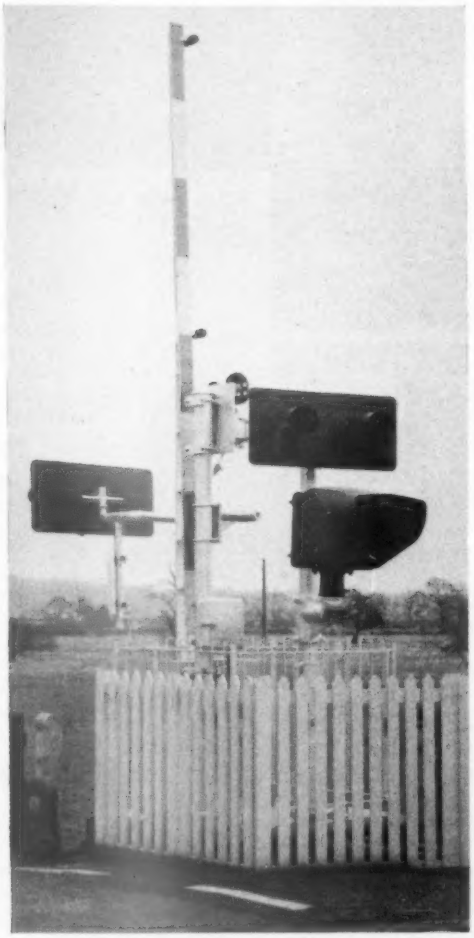

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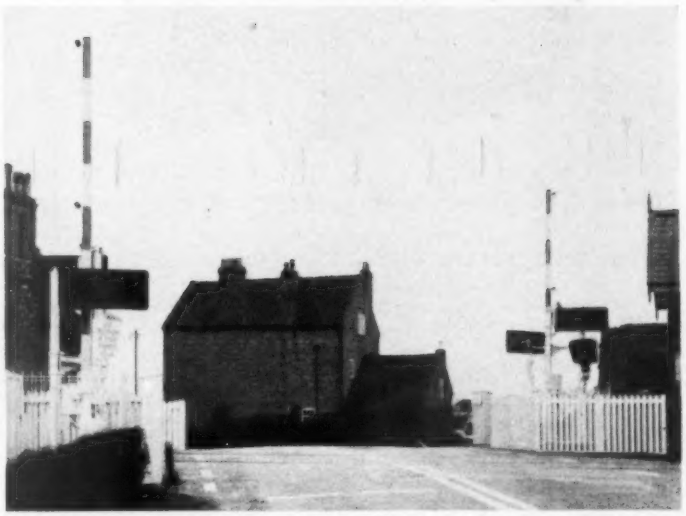

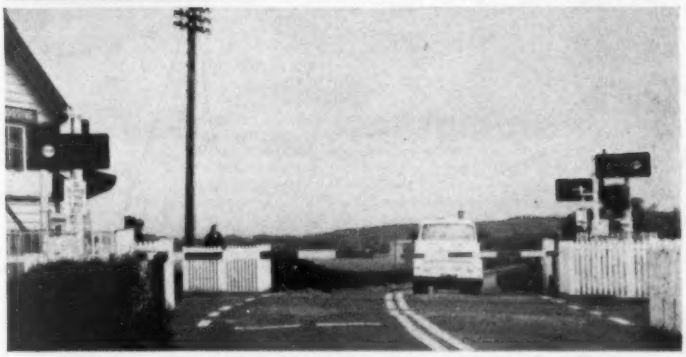

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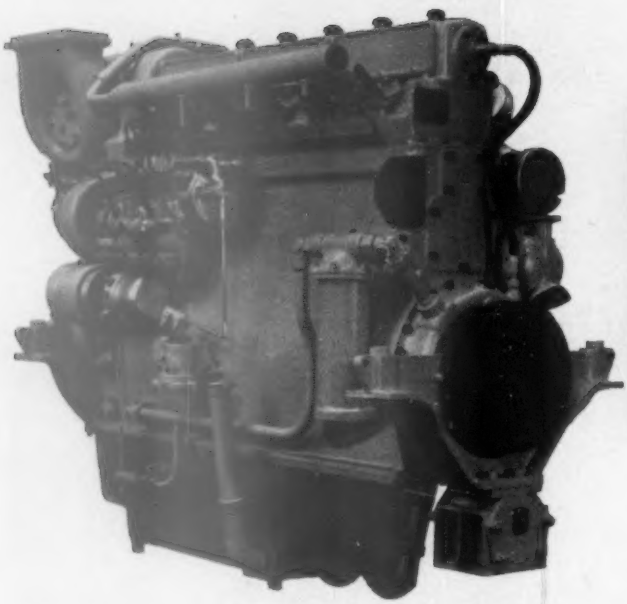

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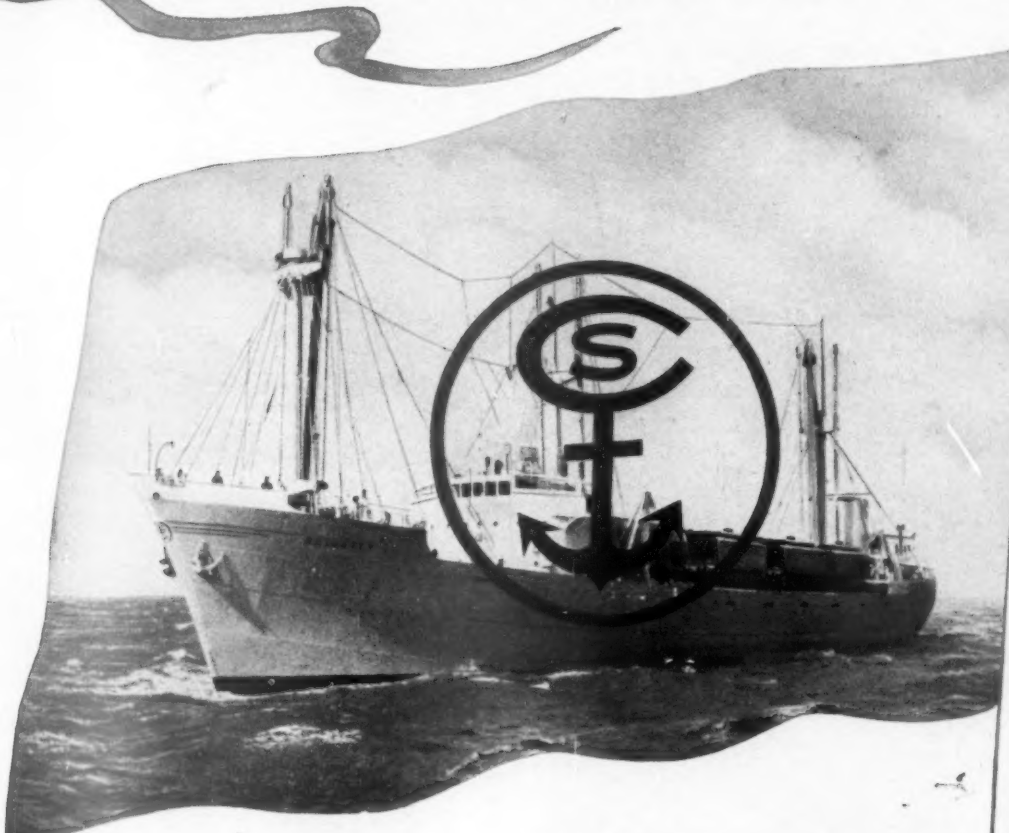

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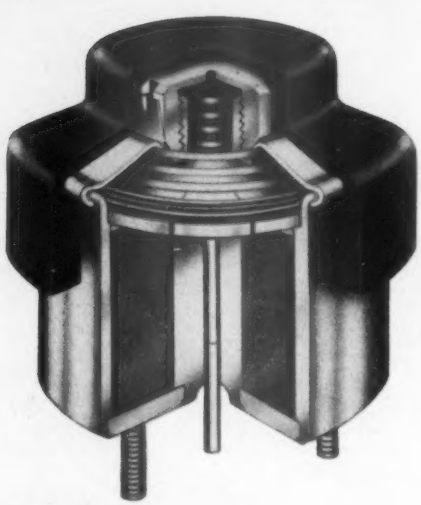

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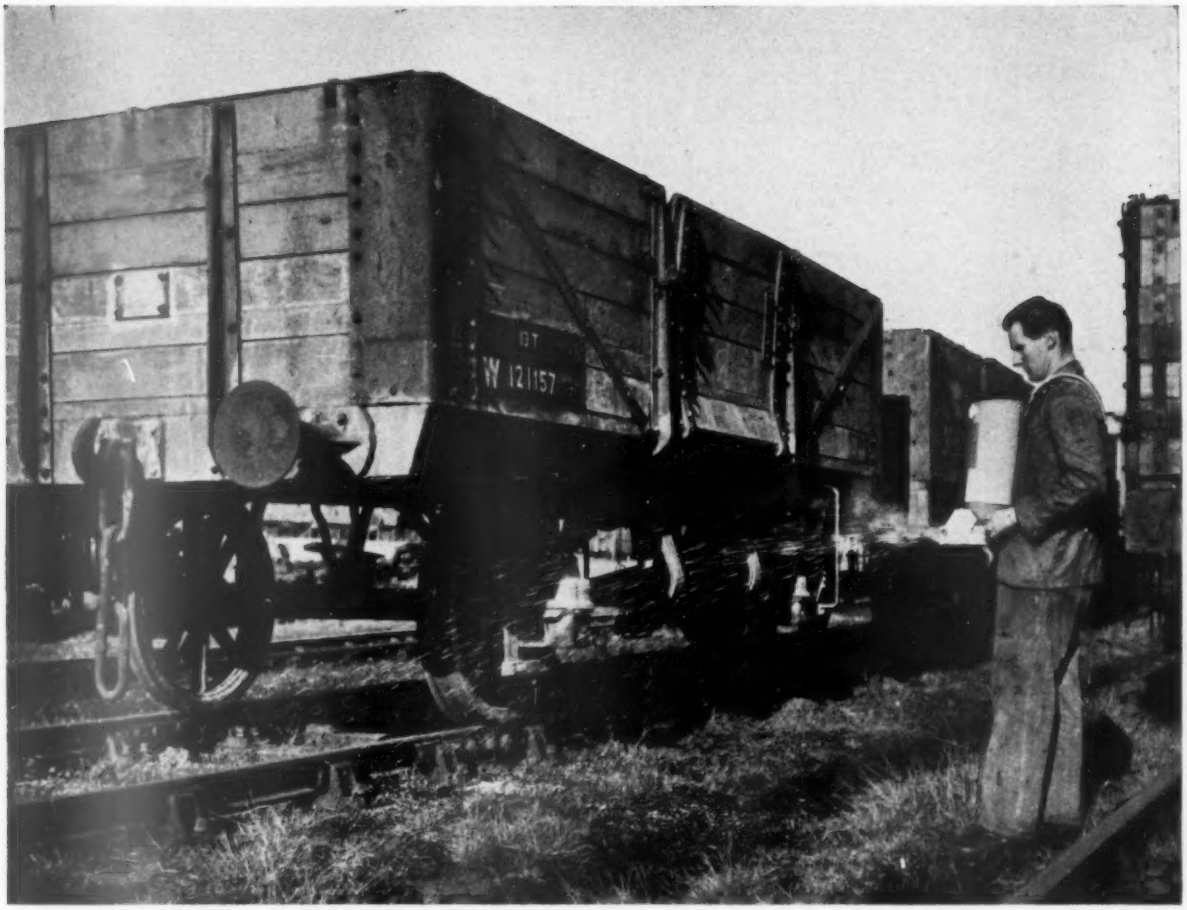

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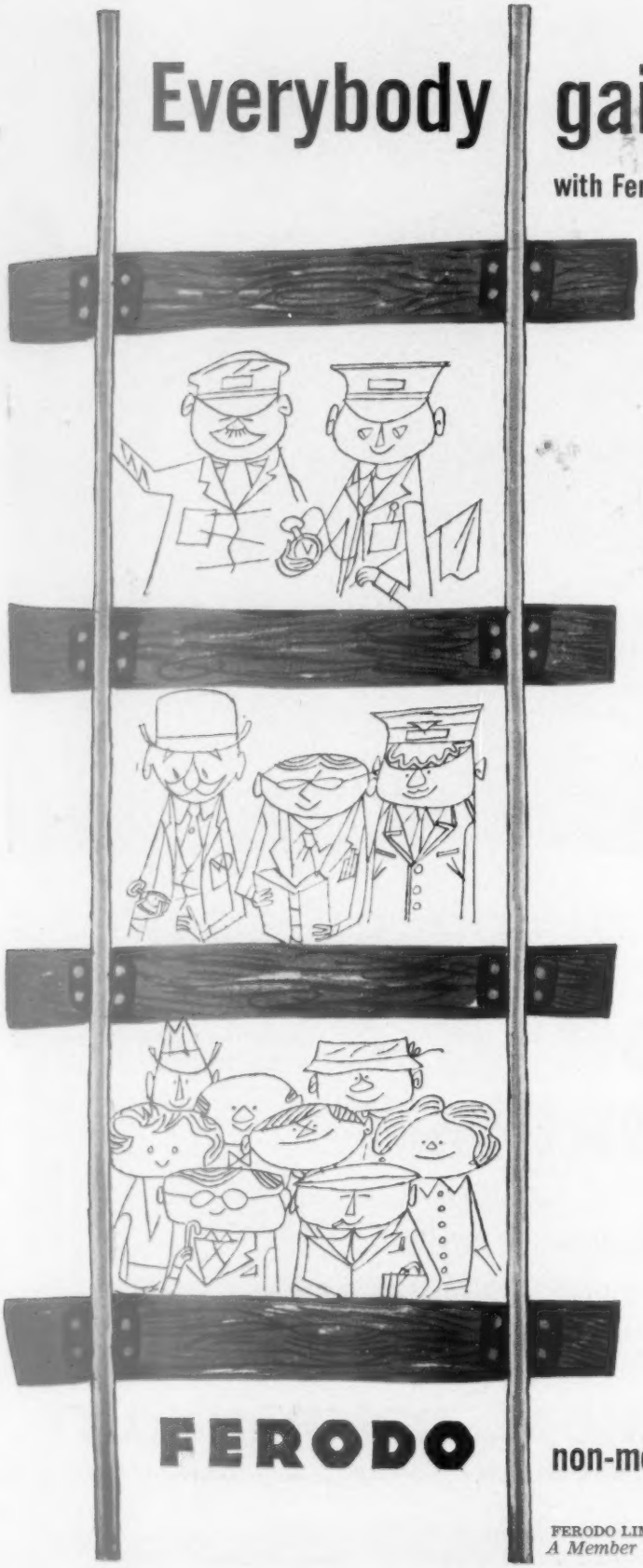

THE TRAIN CREW find that Ferodo non-metallic brake blocks reduce overall braking distances and dramatically improve train control at high speeds. High-speed brake application creates high temperatures: where cast-iron blocks soften and fuse, Ferodo non-metallic blocks act with full effect.

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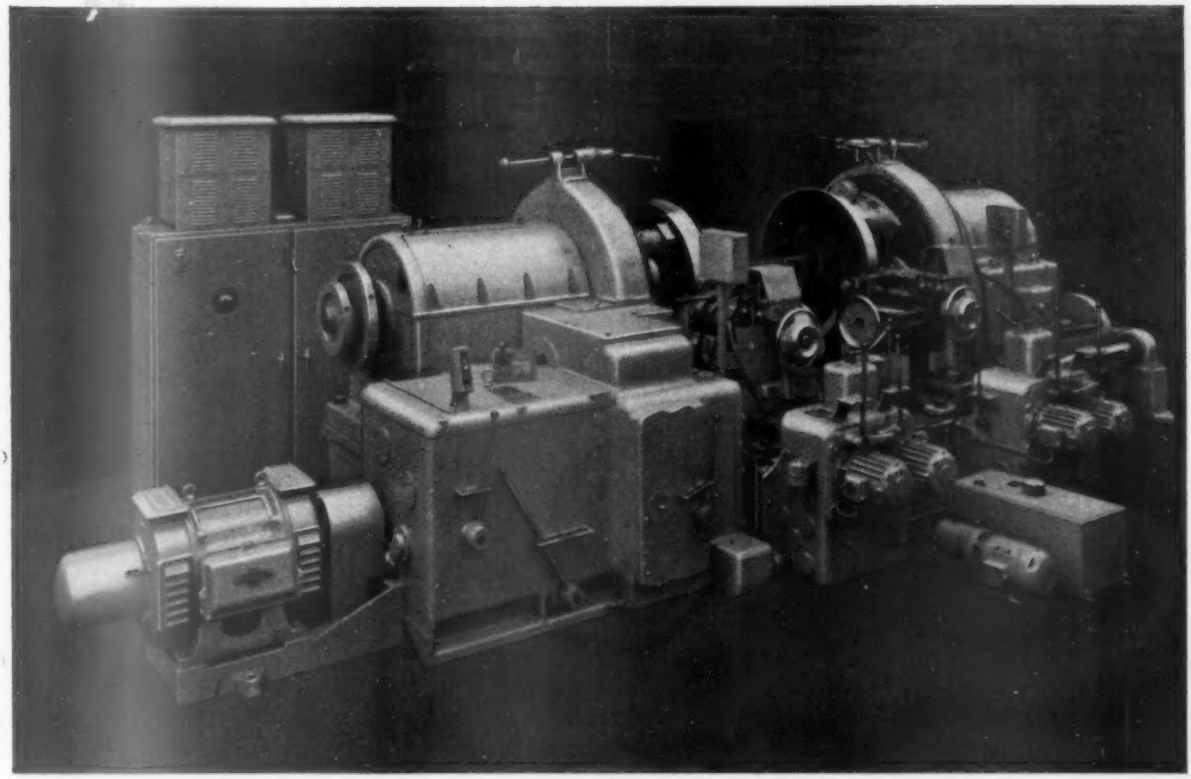

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Our latest model Heavy Duty Wheel Lathe, the 4-ft. size being illustrated here, incorporates all the features which we have developed, as the result of many years' experience, in order to achieve the maximum output possible and at the same time to provide a machine which is economical in tooling and maintenance costs.

The robust construction of the main parts of the lathe can be seen from the photograph and all shafts, bearings, gears, etc., are on equally generous lines. All electrical and mechanical controls are easily accessible and those in constant use are grouped at the operator's position. Loading of the wheel sets is facilitated by the provision of self-contained jack or hoist, as dictated by the shop layout. When preferred, through type machines can be built on similar lines.

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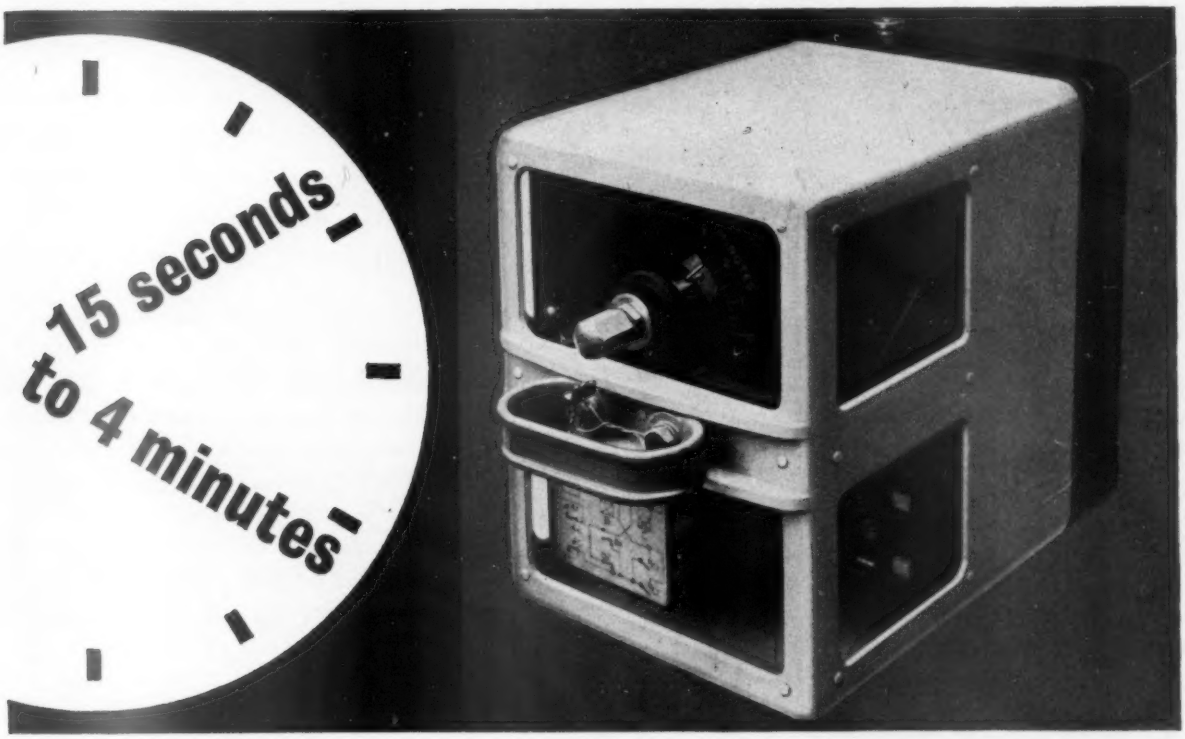

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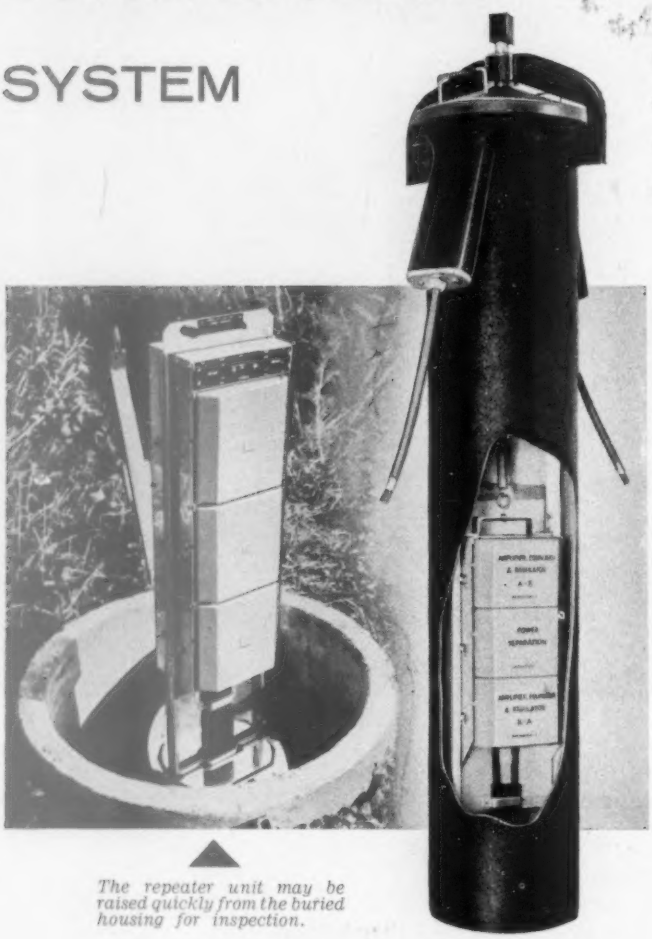

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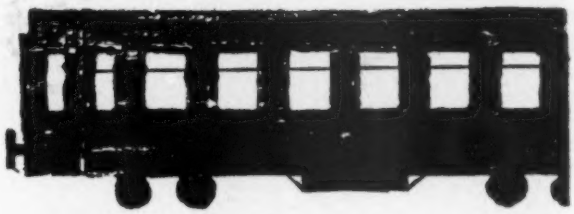

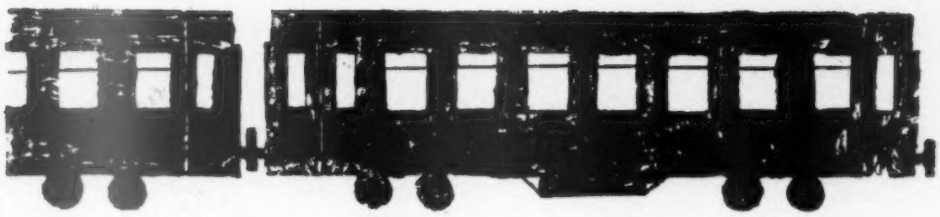

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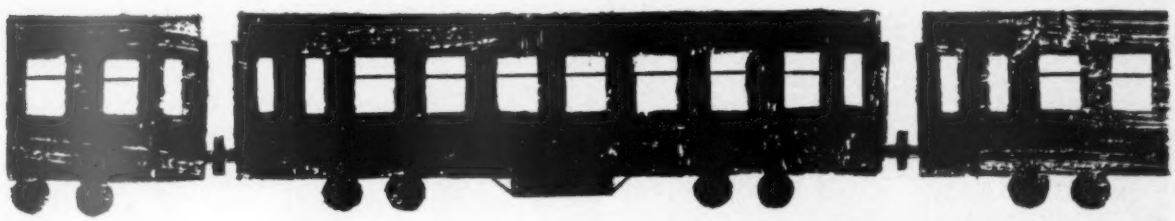

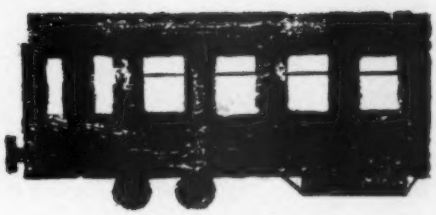

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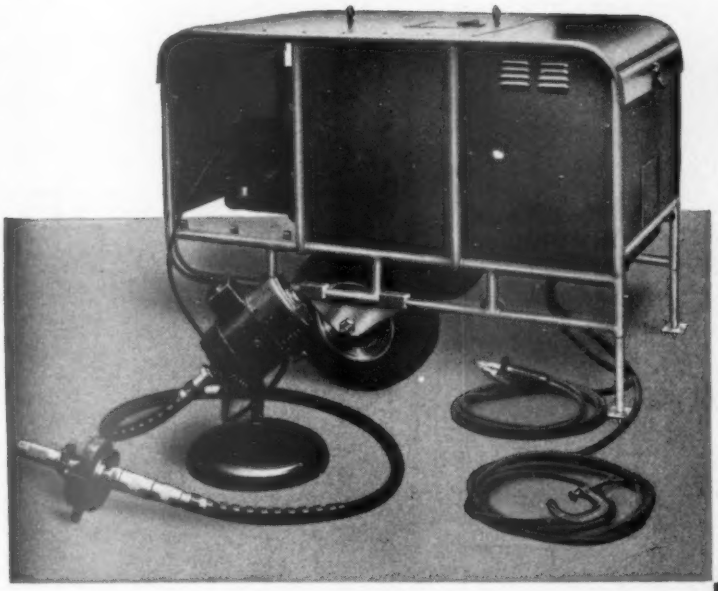

portable welding equipment

for continuous jointing of long welded rails

Developed for use with the system originated by British Railways, this lightweight plant comprises a welding generator, a profile grinding machine and a vertical milling machine. It can therefore carry out the entire process of welding in situ, dressing, profile grinding and milling in an average time of 30 minutes per pair of rail joints for two operators.

The welding generator, driven by a governed 25 h.p. air-cooled engine, provides 300A continuous, with a maximum of 400A. Engines can be supplied for running on petrol or propane gas. The auxiliary generator gives 27.3A at 110V d.c. for operating auxiliary equipment. The complete assembly is mounted in a wheeled tubular frame with all controls, the total weight being about 965 lb. A pair of tubular detachable handles is provided for manœuvring the unit on the site.

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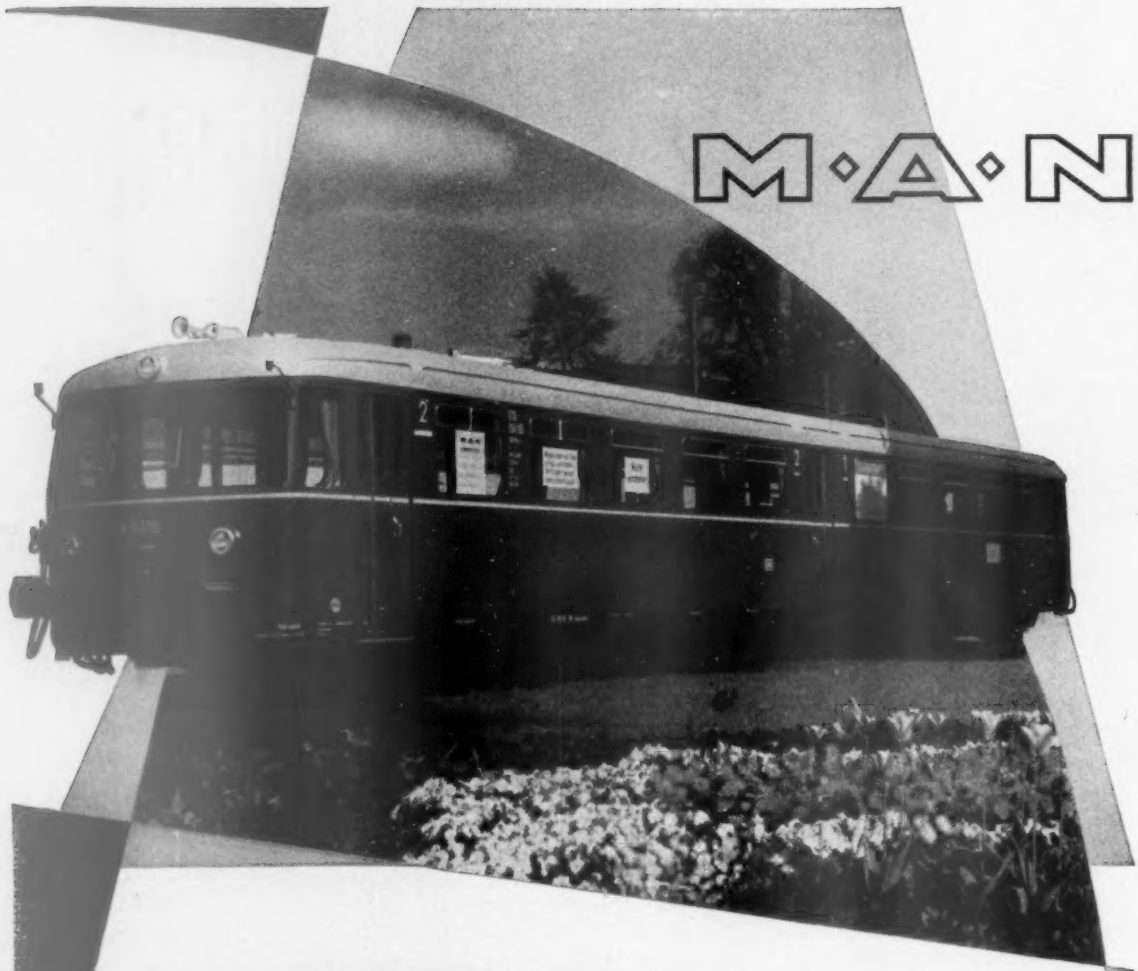

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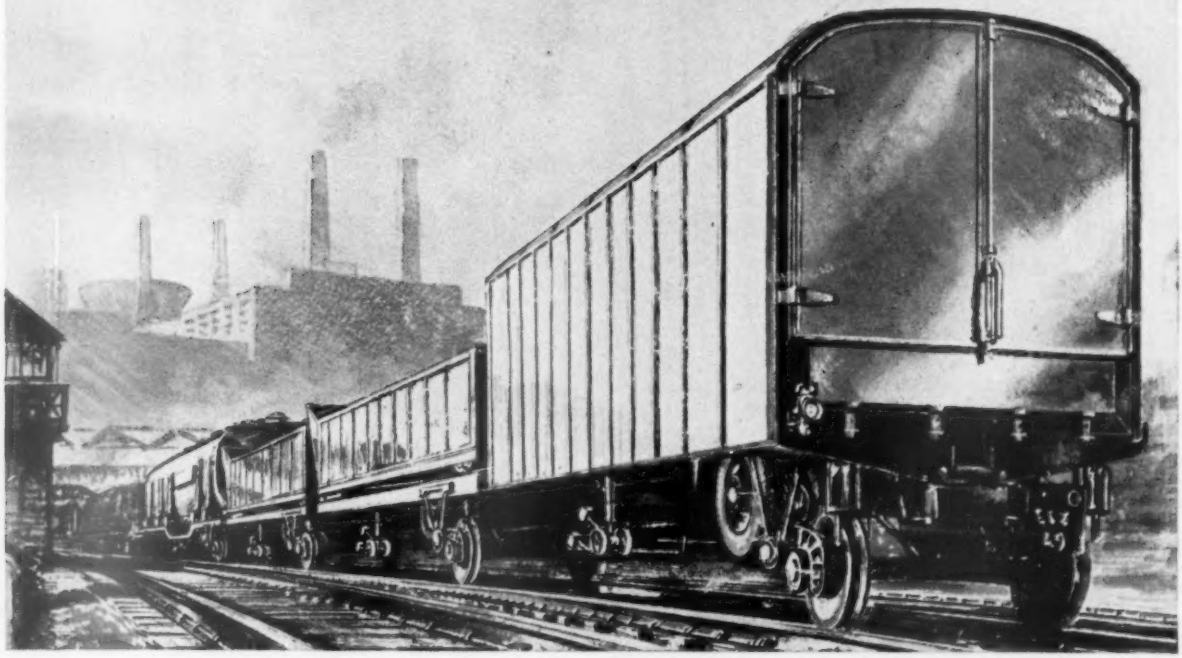
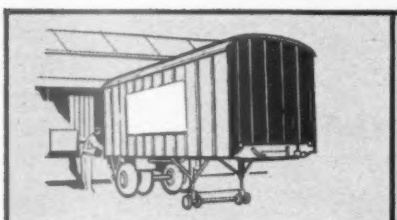
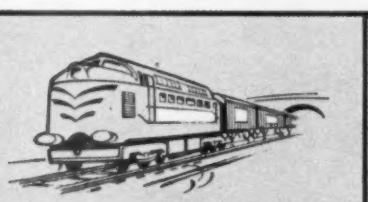


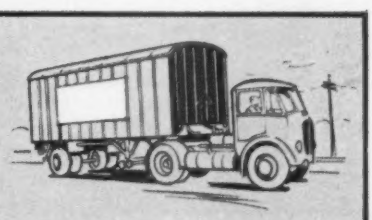
...speed and economy on trunk hauls and door-to-door service too!



1 The Roadrailer, loaded at the factory as an ordinary articulated lorry.



2 The Roadrailer as part of a fast freight train.



3 The Roadrailer converted back to a lorry completes delivery by road.

Now it's an 11-ton lorry, loaded in the usual way and driven by road to the railhead. Only 150 seconds to retract the road wheels and lower the rail wheels and hey presto – now it's part of a fast freight train designed for through travel at an average speed of 60-65 m.p.h.

The Roadrailer brings your railhead to your customer's factory. It brings the best of both worlds, giving traders the economy and uncluttered speed of long-distance rail haulage *plus* the convenience of door-to-door collection and delivery. It can be adapted for liquids, timber, cement – all kinds of traffic.

The introduction of the Roadrailer is in *any* country's interest: it frees the roads, puts trunk haulage on the railway where it sensibly and economically belongs, and helps industry by making transport cheaper and faster.

150 SECONDS — YOU CAN HAVE THE BEST OF BOTH WORLDS

PRESSED STEEL CO LTD

Railway Division,
Linwood Factory, Paisley, Scotland

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B

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For both putting up and maintaining track of finest, longest-lasting quality at minimum cost, this is the finest tamping machine money will buy. Powerful vibratory action and complete push-button control make it exceedingly fast. It's overwhelmingly first choice of U.S.A. railways. Available in U.S.A. standard and wider gauges.

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An excellent production tamper which rapidly produces complete consolidation of ballasts up to 3" in diameter in proportionate out-of-face raises. Highly efficient in tamping hanging ties or sleepers. Entirely push-button operated. Jacks and automatic spacer for double joint ties optional. Available in all standard gauges from meter to widest.

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A complete tamping machine ideal for spotting and smoothing, secondary programs and all yard track maintenance. Utilizes powerful "Maintainer" tamping units. Traveling, indexing and workhead are all hydraulically controlled. All standard gauges.

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Vibratory-electric . . . operated from portable power plant serving 4 tampers. Universally used in low lift and smoothing work as well as major ballast insertion operations. Adjustable handles and interchangeable tamping blades make them quickly adaptable to all workers and tamping requirements.

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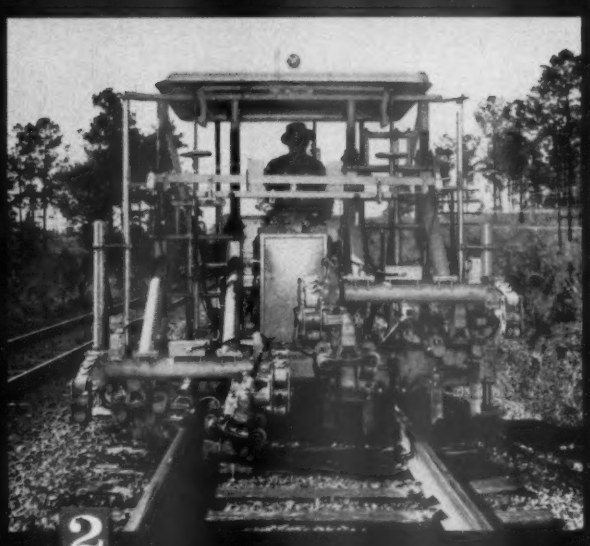
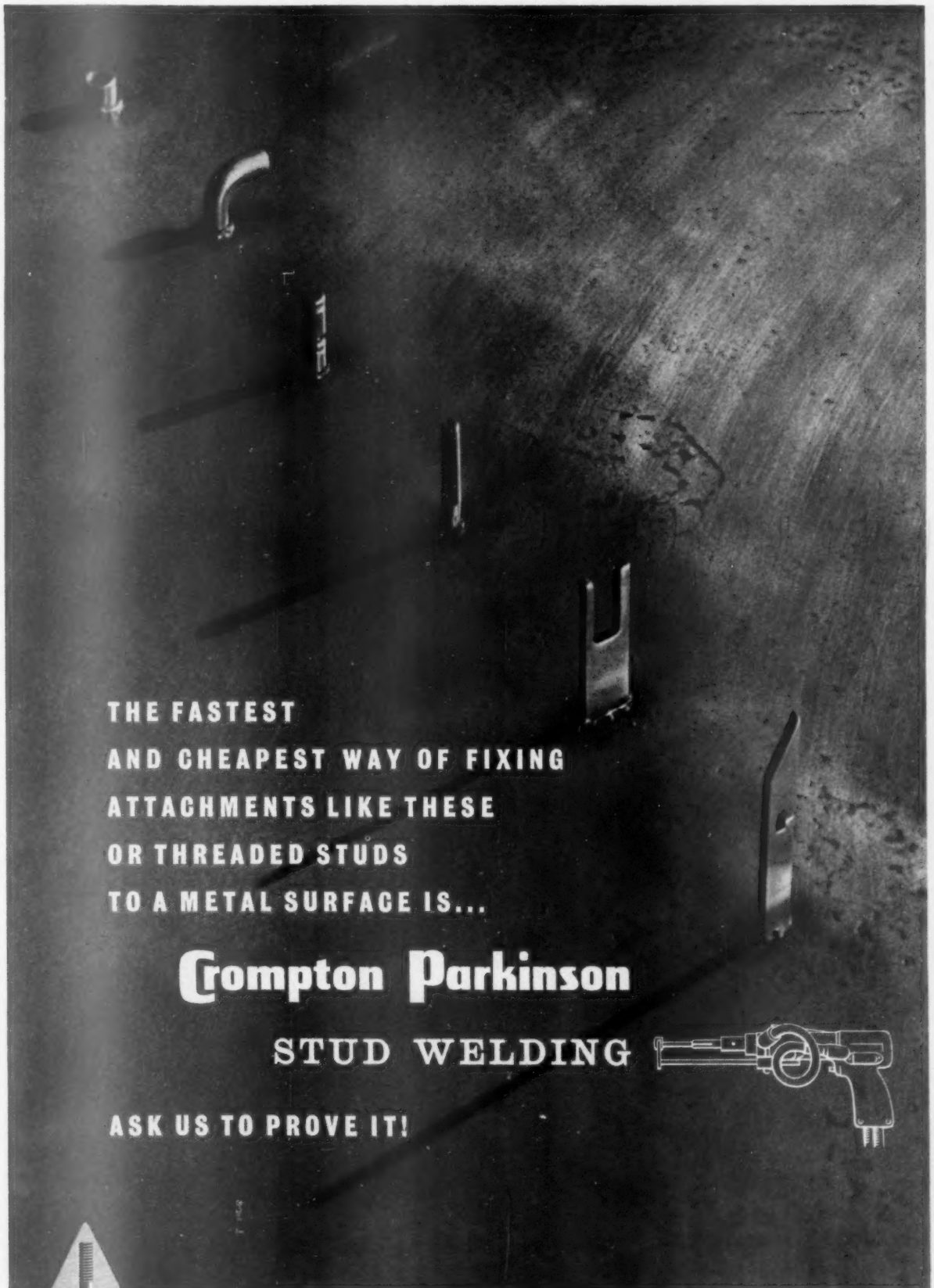
R08

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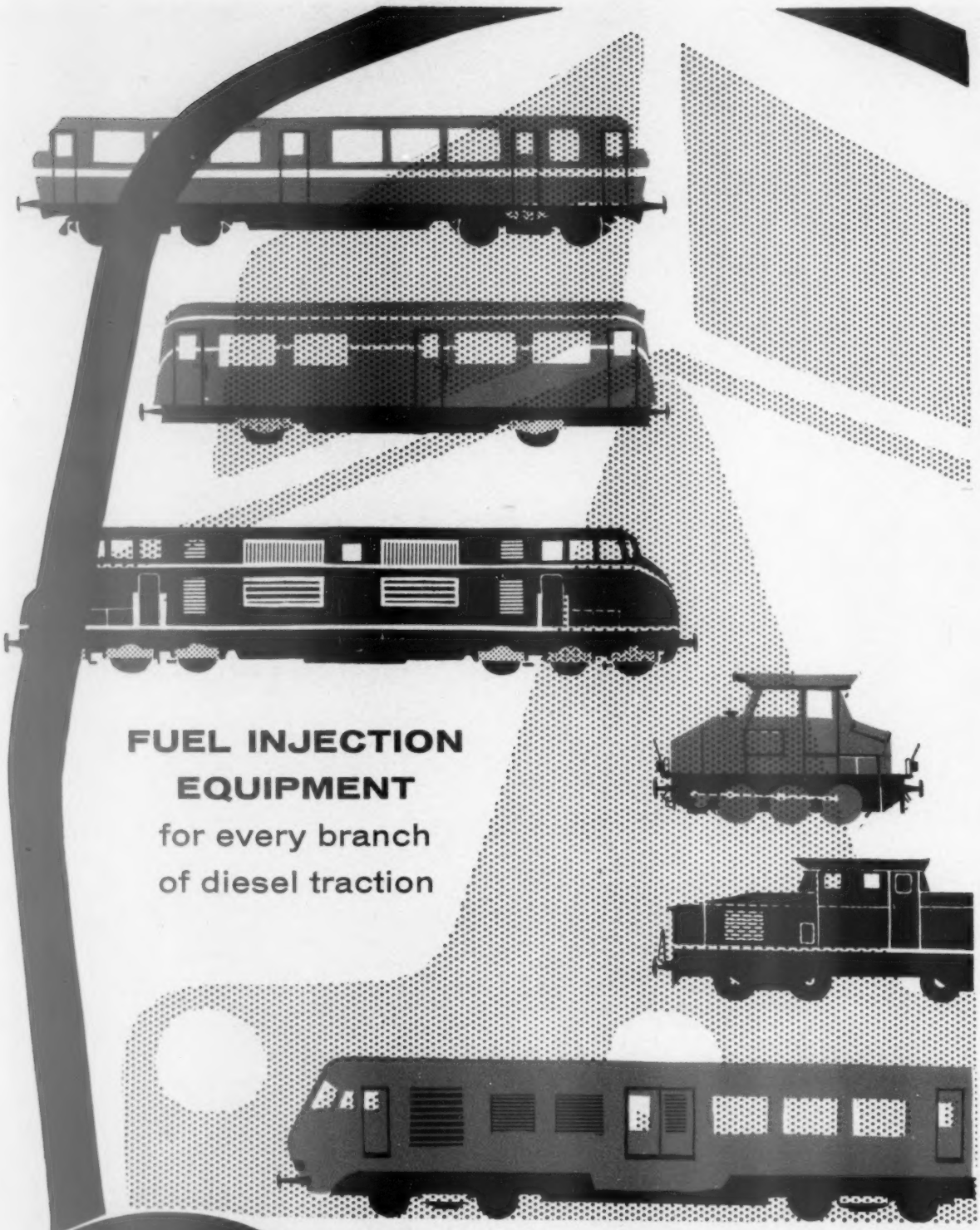

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AP.111

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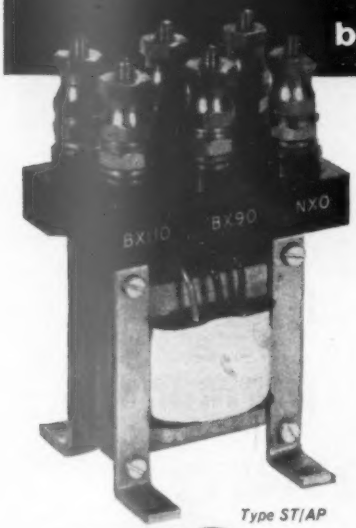
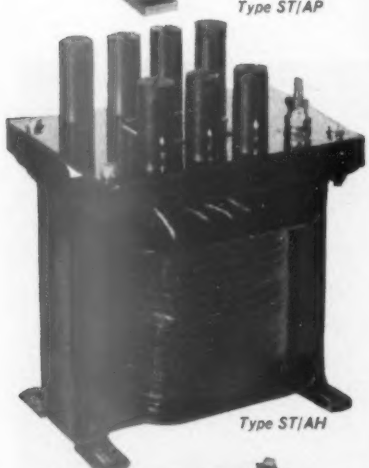
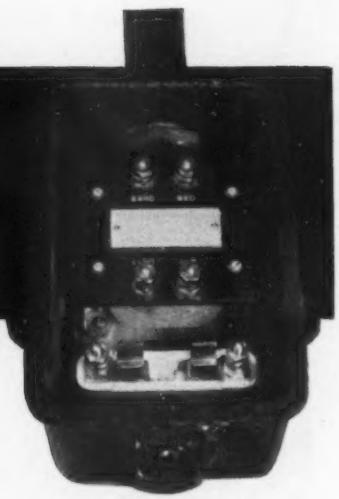
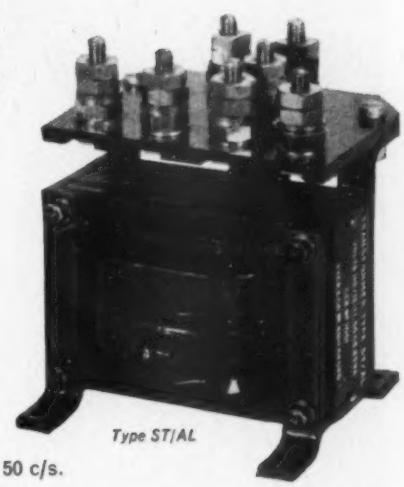


Type ST/AP


Type ST/AH

Type ST/AR


Type PIT


Type ST/AL

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Type PIT: 15VA — 110/110. 50 c/s.
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Type ST/AP: 4VA — 110-90-0-10/12V. 50 c/s.
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CABIN or LOCATION

Type ST/AH: 250VA — 200-230-250-/110-220V. 50 c/s.
Weight 16¼ lb., size 6¼" x 6¼" x 4¾".

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Type ST/AR: 250VA — 650-617-585/113-110-107V. 50 c/s.
Weight: 22½ lb., size of case 10¼" x 8¼" x 10".
Ventilated metal case finished hammer stone grey.

Terminals: 2BA, 0BA, or $\frac{1}{4}$" BSF, with or without shrouds.
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Mountings: Horizontal or vertical, with or without cases.
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A great name in steel leaves its hallmark of dependability on the railways of the world

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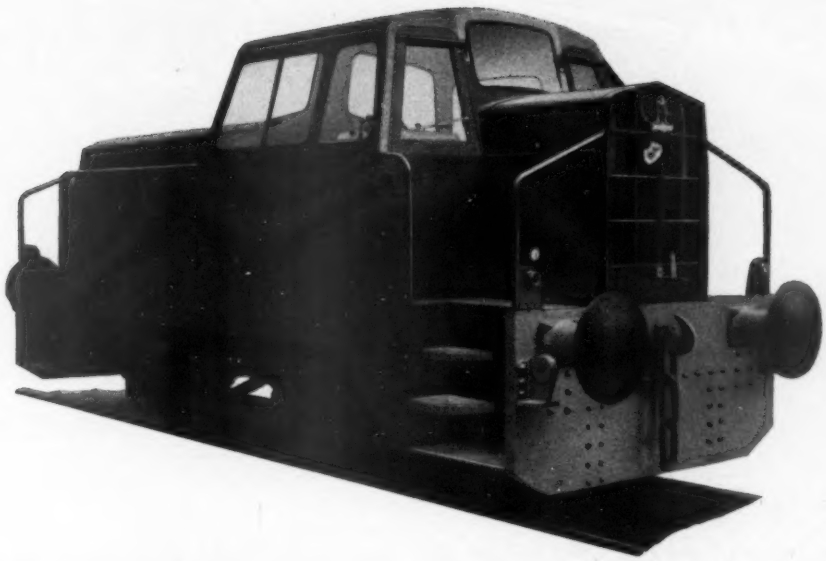

Sentinel chose

Laycock-Knorr

BRAKING EQUIPMENT

View of cab interior showing dual driver controls.

The new Sentinel 34 ton O-4-O Diesel Hydraulic Industrial Locomotives now going into service are all fitted with Laycock-Knorr compressed air brake equipment and pneumatic sanding gear.

This equipment, together with various other types of railway vehicle braking apparatus used extensively on the continent and developed by Knorr-Bremse of Munich over the last half century, is now manufactured and offered by

Laycock
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Keeping pace with progress

WALKER'S

LION packings and jointings

James Walker & Co. can look back over seventy years of service to Britain's railways. But they prefer to look forward, to keep pace with—and often to anticipate—progress in the field of locomotion. Today, Walker's packings and jointings are used on railways throughout the world; and Walker's specialist experience proves invaluable to engineers engaged on railway modernisation schemes.

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'NEBAR'—Bonded cork jointing for oil and cooling water gaskets.

'TWILSTELE'—Woven steel and asbestos gaskets for extreme high temperature.

'METAFLEX'—Spiral edge-wound stainless steel and asbestos gaskets.

'UNILION'—General purpose jointing for oil and steam.

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'WALLICO' GAUGE GLASS RINGS—Square, hexagon and cone sections.

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In special bonded cork for concrete, wooden and steel sleepers. Technical literature or information is available whatever your requirements.

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DEPOTS THROUGHOUT THE WORLD

Tib. 353

44 PULLMAN *Luxury Coaches*

BY

The new coaches for the "Master Cutler," "Yorkshire Pullman" and "Tees-Tyne Pullman" have all been supplied by METRO-CAMMELL.

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TAYLOR JUMBO CRANES BREAK THROUGH THE COST BARRIER

Cut your demurrage costs—with the speed of a TAYLOR JUMBO! . . . the crane designed to supply the perfect answer to rising freight costs. A powerful, low-cost combination of diesel economy and hydraulic simplicity, these cranes bring fast, safe handling to all points of the goods yard, keeping freight moving and eliminating congestion.

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Taylor made for goods yard handling 717

GENERAL MOTORS LOCOMOTIVES

. . . scientific packaging protects parts in shipment and in storage!

This picture of a carton of exhaust valves goes a long way to explain what we mean by scientific packaging which protects General Motors locomotive parts both in shipment and in storage.

The carton itself is engineered for strength and light weight. No chance for parts to rattle around and become damaged during shipment or normal handling. And shipping costs are kept to a minimum.

VPI Wrap for rust prevention

All metal parts are packed with VPI, a paper that gives off a vapour which positively prevents corrosion. More than a decade of use has proved the effectiveness of this clean, lightweight vapour-phase corrosion inhibitor. Parts sealed in their cartons stay *factory-fresh!* And because there's no greasing or spray-coating required, the costly and involved process of degreasing is eliminated. Parts can be used immediately upon unpacking.

Exclusive skin packaging

Another development for protection of gaskets and other small parts is skin packaging. A transparent film, tightly vacuum-sealed over the contents, provides immediate visual identification without the package being opened. Gaskets retain natural moisture—won't dry out or shink even when stored for a year or more.

The thoroughness of General Motors parts packaging is worth keeping in mind when you are in the market for Diesel locomotives. It's one of the smaller, yet nonetheless important reasons why General Motors locomotives *cost less in the long run.*

GENERAL MOTORS OPERATIONS OVERSEAS

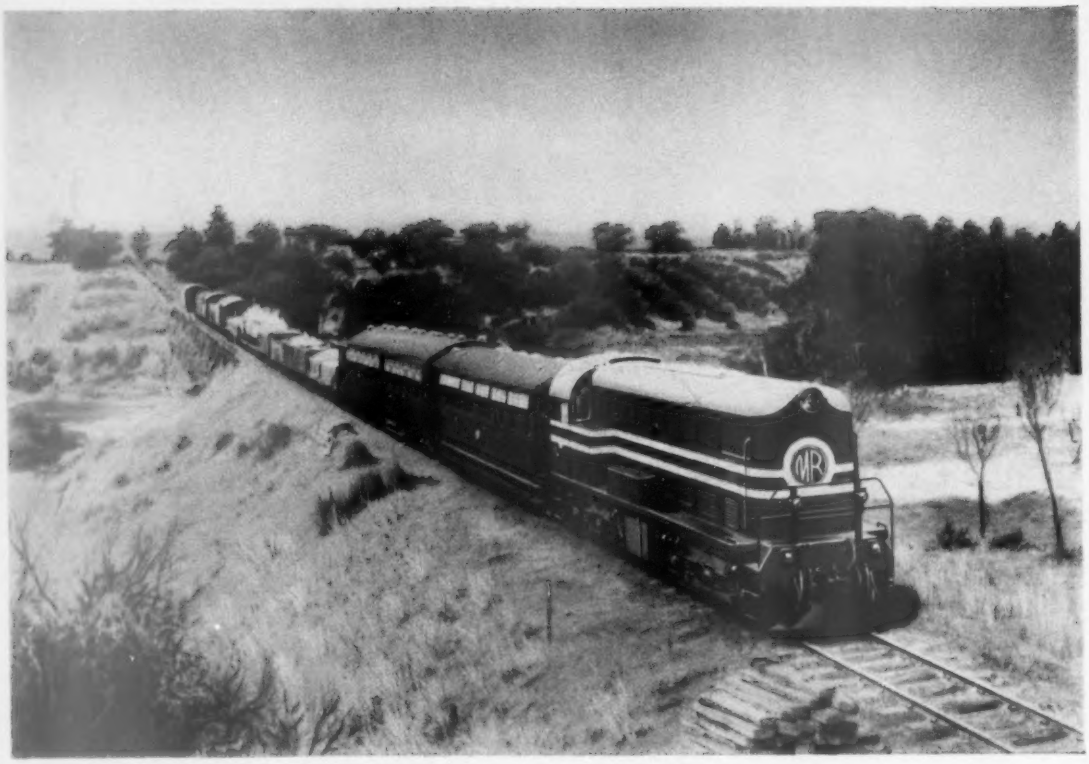
Division of General Motors Corporation,
New York 19, N.Y., U.S.A. · Cable Address: Autoexport

ASSOCIATE BUILDERS: AUSTRALIA—The Clyde Engineering Co. Pty., Ltd., Sydney, N. S. W. • BELGIUM—LaBrugeoise et Nivelles, St. Michel-lez-Bruges • GERMANY—Henschel-Werke, GmbH, Kassel SOUTH AFRICA—Union Carriage & Wagon Co. (Pty.) Ltd., Nigel, Transvaal • SPAIN—Material y Construcciones, S. A., Barcelona SWEDEN—Nydqvist & Holm Aktiebolag, Trollhattan

LOCOMOTIVE PLANTS: Electro-Motive Division of General Motors, La Grange, Illinois, U. S. A. General Motors Diesel Limited, London, Ontario, Canada

General Motors subsidiaries, branches or representation throughout the world

World's Highest Standard—270 to 2600 H. P.



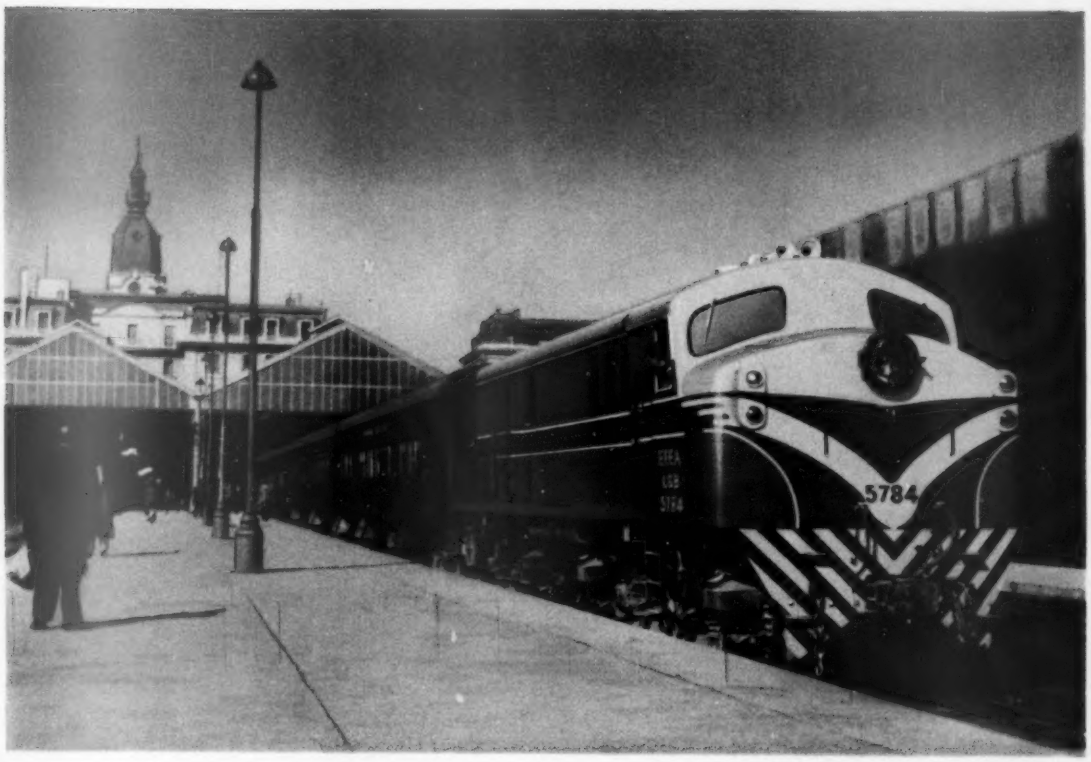
Seven 790 h.p. diesel-electric locomotives have been supplied by 'ENGLISH ELECTRIC' for use on the Midland Railway of Western Australia. The mechanical parts of the locomotives were designed and built by 'ENGLISH ELECTRIC' in Australia.

'ENGLISH ELECTRIC' diesel-electric locomotives are in operation throughout the world. On all duties, including intensive

'ENGLISH

in association with: VULCAN FOUNDRY

TDD 85



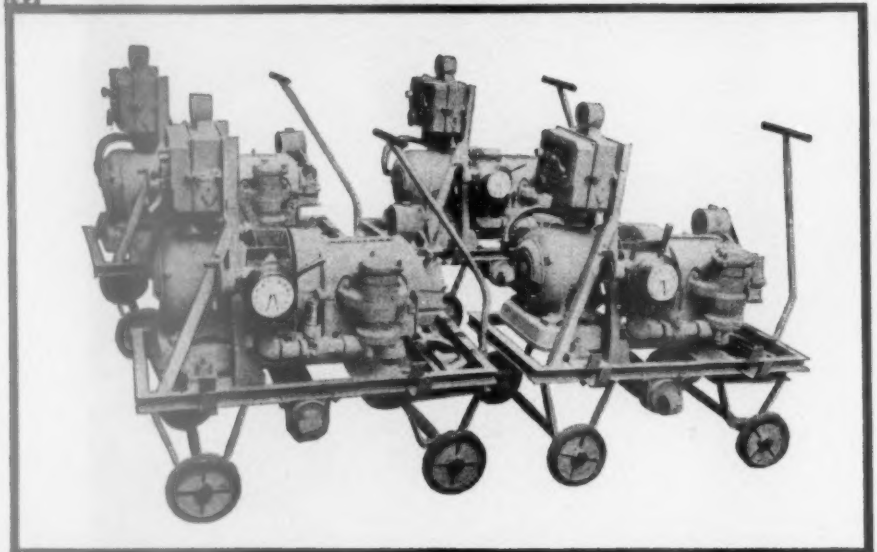
Twenty-one of these 'ENGLISH ELECTRIC' 1,000 h.p. general purpose diesel-electric locomotives are in service with the General Belgrano Railway, Argentine. Similar locomotives are also in service in Brazil.

suburban services as in the Argentine and mixed traffic work in Australia, they are well-known for trouble-free working.

ELECTRIC'

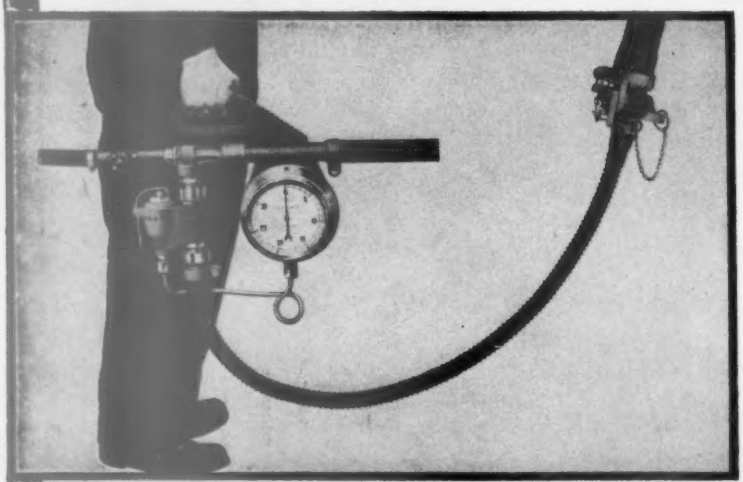
ROBERT STEPHENSON & HAWTHORNS

GRESHAM'S
VACUUM BRAKE TESTING EQUIPMENT



Large stationary sets for marshalling yards, complete with testing valves and automatic control of exhauster motors, also available.

Illustration shows part of a consignment of motor driven portable testing sets incorporating Northey rotary exhausters of 90 c.f.m. capacity.



Portable compressed air operated vacuum testing set for dealing with single vehicles in workshops or repair depots.

Leakage searcher for locating defective brakes on vehicles already coupled together and attached to a locomotive.

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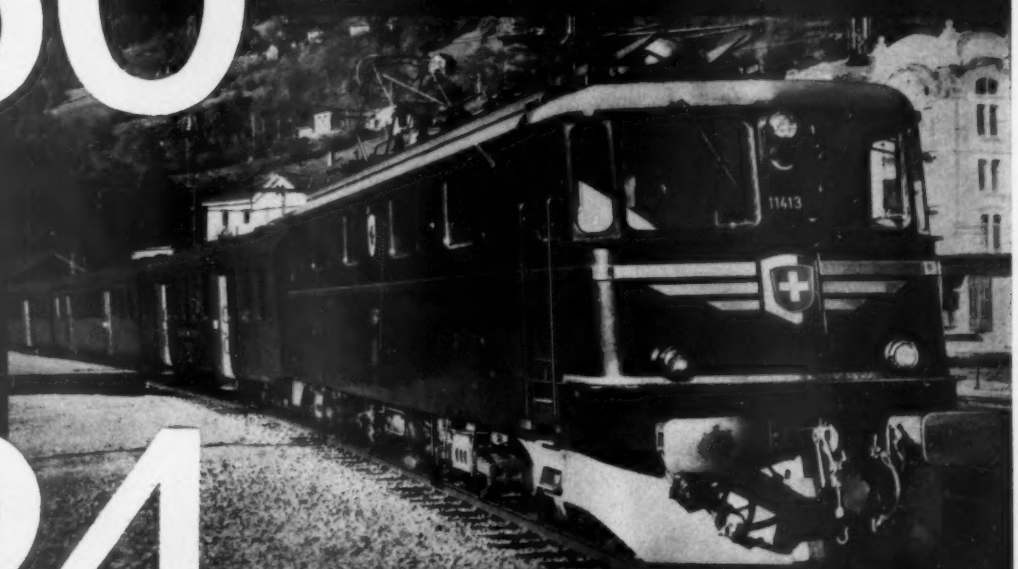
GC 11

SLM

90 years experience in design and manufacture of locomotives and railcars!

50

of these 6000 HP Co-Co type locomotives are giving excellent service on the Gothard and the Simplon lines of the Swiss Federal Railways.



24

To meet traction requirements due to increasing traffic 24 more of these powerful and reliable engines have been ordered lately.

35

A further contract for the supply of 35 Diesel-electric locomotives, 600 HP each, fitted with SLM traction Diesel engines has also been placed by the Swiss Federal Railways.

Swiss
Locomotive and Machine Works
Winterthur

Control apparatus in the power car.

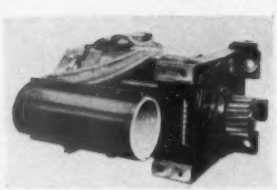
New de luxe Pullmans powered by G.E.C.

Sustained speed . . . consistent performance . . . smooth running . . . all these will be found on the five new British Railways de luxe Diesel-electric Pullman trains designed and built by the Metropolitan-Cammell Carriage & Wagon Co. Ltd., with G.E.C. as the contractors for the principal power equipment.

G.E.C. supplied ten complete equipments comprising N.B.L./M.A.N. twelve-cylinder diesel engines direct-coupled to G.E.C. main generators with overhung auxiliary generators, fully spring-borne traction motors, spring drives and control gear—all designed to provide a maximum service speed of 90 mile/h.

The equipment for these five de luxe Diesel-electric Pullmans forms another G.E.C. contribution to the modernization of British Railways.

Driver's Cab



One of the traction motors

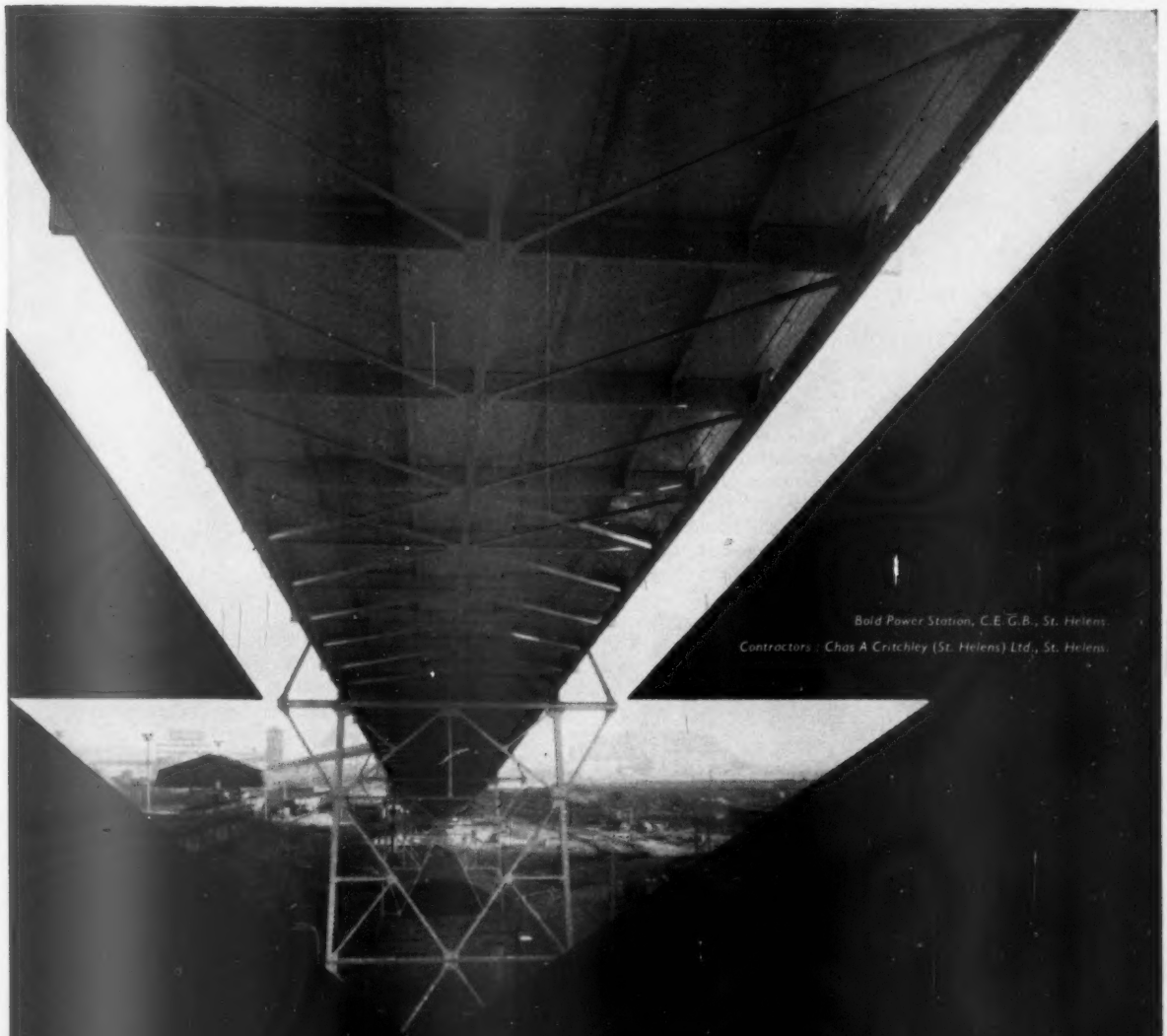
Main and auxiliary generator of the main power unit in the power car. The servo-regulator is seen above the generator.

rely on the experience of G.E.C.

THE GENERAL ELECTRIC COMPANY LIMITED OF ENGLAND

TRACTION DIVISION, BIRMINGHAM 6

379



Bold Power Station, C.E.G.B., St. Helens.
Contractors: Chas A Critchley (St. Helens) Ltd., St. Helens.

Prevent CORROSION

Zinc Chromate Primer and Epilux 1.... two outstanding anti-corrosive coatings widely used throughout industry, protect steelwork at Bold Power Station

ZINC CHROMATE PRIMER: A water-resisting medium, ensures maximum defence against corrosion on non-ferrous metals. Cheaper than red lead, it spreads further and more easily, dries faster and harder; good storage life, easy to mix. In yellow, green and red.

EPILUX 1: This air/drying enamel is based upon Epoxy resins. It possesses remarkable flexibility and abrasion resistance. In addition Epilux 1 has shown exceptional ability to withstand the attack of alkalis and mild acids ... good resistance to water, excellent adhesion. Superior to traditional gloss paints in heavily chemical laden atmospheres

ZINC CHROMATE PRIMER ✳ EPILUX 1

BRITISH PAINTS LIMITED *Industrial Maintenance Division*

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D

METCALFE'S

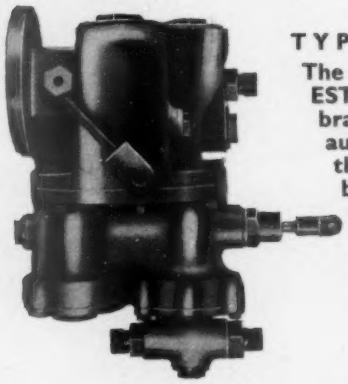
AIR BRAKE EQUIPMENT for

Carriages and Wagons

OERLIKON PATENT DESIGN

TYPE EST3d.

This standard and basic design of Triple Valve enables the controlled application and release of brakes on goods and passenger trains. It is suitable for all sizes of brake cylinder and is in accordance with the conditions laid down for the admission of goods and passenger trains for international traffic. Leaflet A.9.

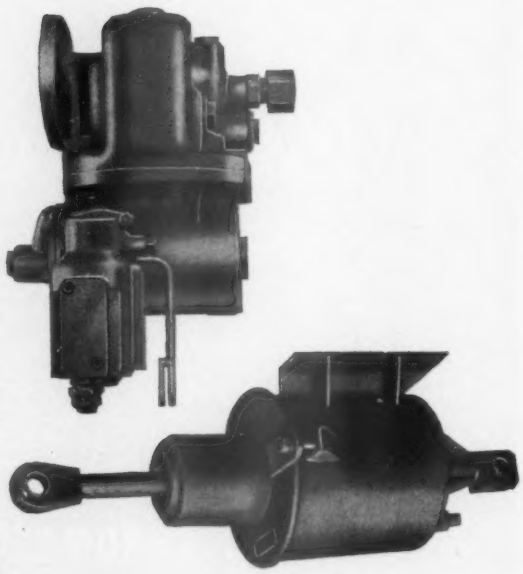


TYPE EST4d/AL.

The AL device used in conjunction with the EST Triple Valve, as illustrated, enables the brake cylinder pressure to be regulated automatically in proportion to the load on the vehicle, thus enabling the maximum brake efficiency to be obtained under all conditions. Among the advantages associated with this equipment are the simplicity of installation, further, the brake cylinder filling and releasing times are unaffected by load changes. Leaflet A.8

TYPE EST4d/R TRIPLE VALVE

In this instance the type R device has been added to the EST Triple Valve to enable two-stage braking to be obtained. This arrangement when applied to high speed passenger coaches and controlled by the vehicle speed enables the maximum brake efficiency to be obtained and greatly reduces the distance required for stopping a train. This style may also be used for simple load and empty braking with the two stages Hand controlled. Leaflet A.5.



TYPE SB BRAKE CYLINDER

(Made under licence from STABEG)

A simple lightweight design of Brake Cylinder embodying a patent piston seal giving automatic lubrication to the cylinder walls and exceptionally long life to the seal. A further patent covers a security device which simplifies maintenance and examination of the Cylinder which is made in all standard sizes and styles. Leaflet A.14.

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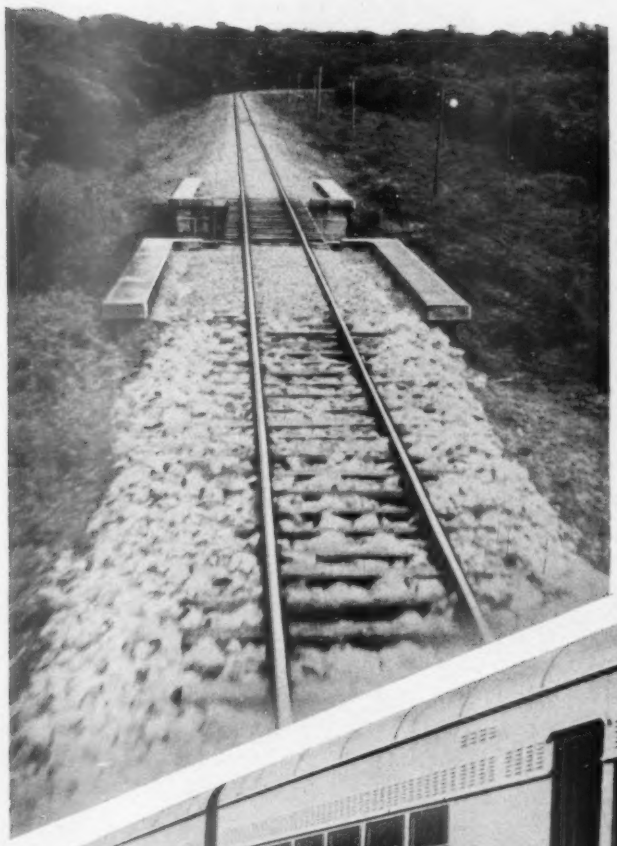
Economy along these lines



of the C.M.F. Brasileiro-Boliviana has been furthered by the introduction of Wickham lightweight railcars. Wickham Stressed Frame Construction, producing cars which combine great strength with power-economy lightness, is a principle proved and appreciated on some of the most rugged railways in the world.

WICKHAM CARS MAKE THE MOST OF THEIR POWER UNITS

240 b.h.p. twin-engined
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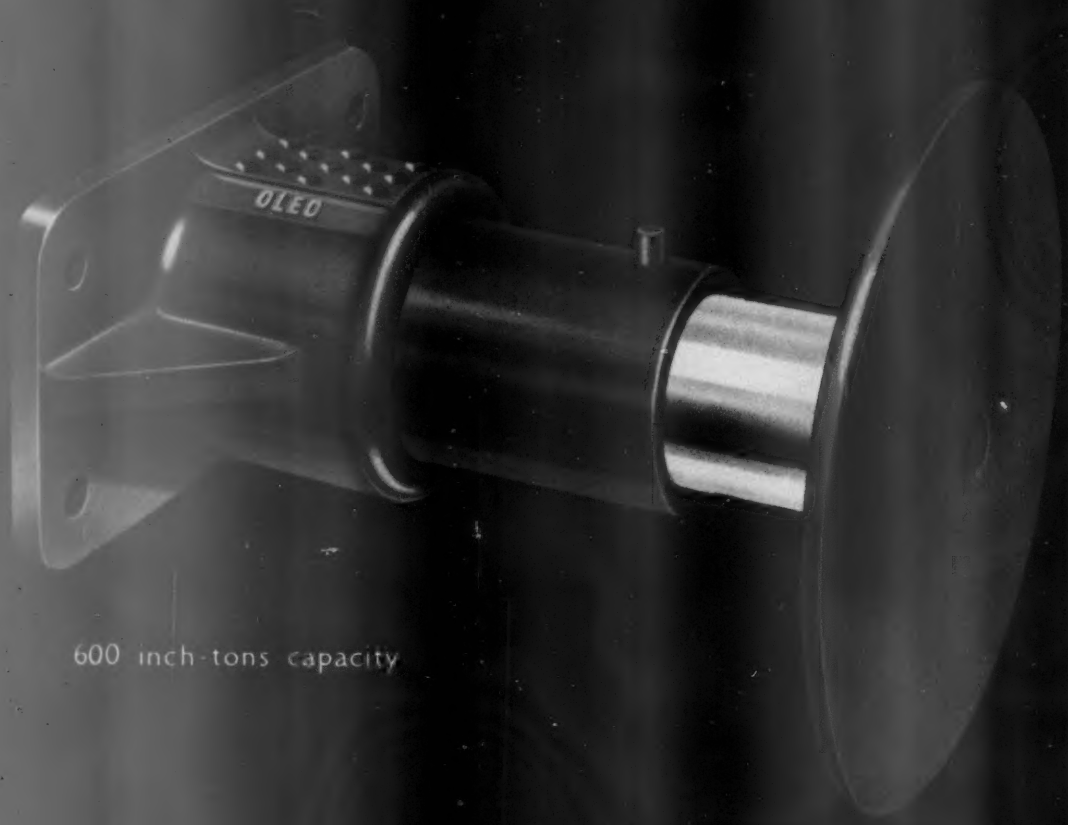

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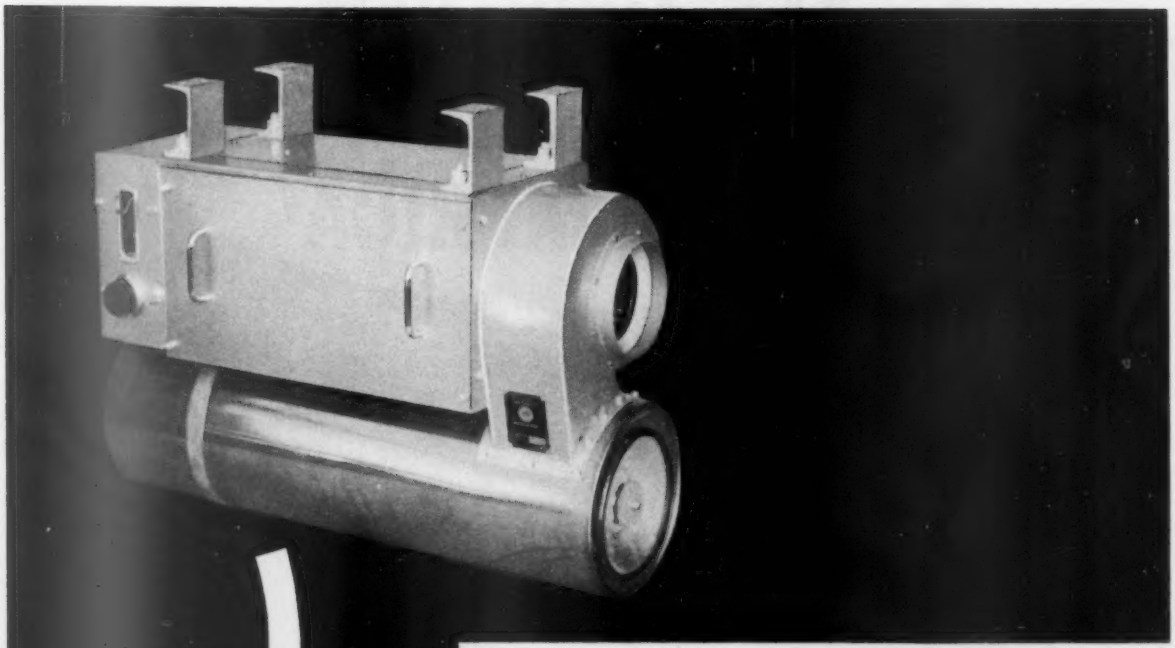

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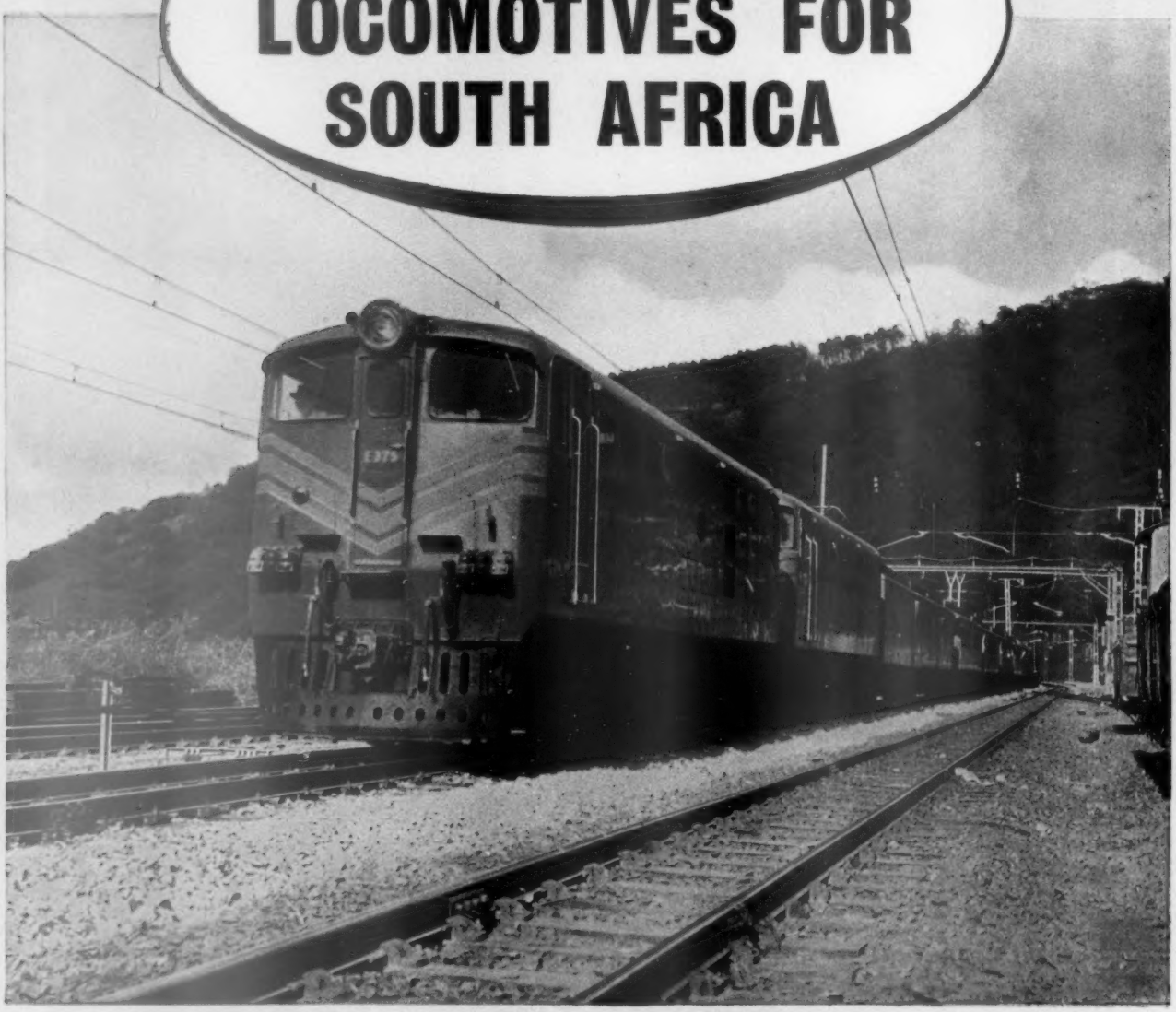

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Railways Board and Railway Boards

THE formation of the various boards to be set up under the Government's proposals outlined in the White Paper on the re-organisation of the nationalised transport undertakings is still one of the principal topics of conversation and concern among railway officers. The Railways Board, apparently, is to be the top level in the projected organisation. The constitution of the board is still a matter of conjecture. Apart from a chairman and vice-chairman, it is to consist of "a representative from each of the Regional Railway Boards." "Representative" may or may not mean the Regional General Manager, but in the case of the Regional Boards which are to replace the present Area Boards the post of the Regional General Manager will carry a seat on the Regional Board. A peculiar position will arise if a Regional Board representative on the British Railways Board is someone other than the General Manager; there will obviously be a danger of duality of responsibility. On both the Railways Board and the Regional Boards provision is made for full-time as well as part-time membership. On the Railways Board, there are to be "certain full-time members with special responsibilities" and "one or two part-time members." On the Regional Boards, members are to be "few in number" and "there will be a strong element of full-time members." Until there is considerably more clarification as to what is meant by these phrases, it is impossible to guess whether the top board will have functional authority in the sense that was understood in the time of the Railway Executive. The White Paper merely says that "the Board will perform only those central functions which are essential to the running of the railways as a single entity." A great deal is going to turn on how the last part of that sentence is interpreted. The strong element of full-time members on the Regional Boards may, perhaps, be the equivalent of the Chief Officers. If not, a position may arise in which the General Manager and his Chief Officers may be bedevilled by what, in effect, may become a number of managing directors. A great deal of elucidation on points such as these is obviously needed as early as possible. If we are wrong in our assumption that the draughtsmen of the White Paper are not clear in their own minds as to what these points mean and how they are to be implemented, the sooner the position is made plain the better for the railways and for the reputation of the Ministry.

Press and transport

THE Federation of Railway Lecture & Debating Societies, which incorporates seven debating societies which function at the larger centres in the North Eastern Region of British Railways, is an active organisation. Its members are obviously keen, and no doubt this is due, to a very large extent, to the efforts of the organisers to provide discussions on matters which are in the minds of the groups. Last week at York a symposium on "The Relations Between the Press and Transport" was presented under the chairmanship of Mr. W. H. Vine, Commercial Officer of the Region, who presided in the unavoidable absence on business of Mr. F. C. Margetts, Assistant General Manager (Traffic). The Editors of *The Railway Gazette*, *Modern Transport* and *Northern Echo* formed a panel and endeavoured to answer a number of questions raised from the body of the hall. It was a stimulating evening and the value of direct contact between the editors and the members of the audience was as great to the former as to the latter.

Rail transport to London Airport

A FAST direct link between London Airport and the centre of London has been talked about for many years, but it would appear that indecision over the form of transport the link should take has been the stumbling block to progress. Numerous monorail systems have been considered and rejected, but at a recent meeting in London senior officials of B.O.A.C. and B.E.A. gave a guarded welcome to yet another monorail proposal by M. André Meffre, a French engineer. It is estimated that it could carry up to 30,000 passengers an hour each way and travel at 75 m.p.h. An exclusive link of some kind is essential, but Lord Douglas of Kirtleside, Chairman of B.E.A., is not convinced that the monorail is the final answer. A

conventional rail service has not been ruled out. A spur could be constructed to leave the Southern Region lines at Feltham, but difficulty might be experienced in operating airport trains over busy suburban lines. On the other hand, the monorail link would cost some £1,600,000 a mile, about twice as expensive as a normal railway. With either form of transport, the siting of a rail terminal within the airport will present a major problem.

Overseas railway traffics

East African Railways & Harbours approximate railway revenue for the month of December, 1960, amounted to £1,685,000 compared with £1,715,000 in December, 1959, a decrease of £30,000. Public goods traffic receipts fell by £21,000, road service receipts by £2,000, hotels and catering by £6,000, and miscellaneous earnings by £11,000. Receipts from inland marine services increased by £4,000. Public goods traffic railed up-country from Mombasa Island amounting to 88,000 tons showed an improvement on the 85,000 tons in December, 1959. Railings to the coast at 62,000 tons were 1,000 tons higher than in the previous December. Salvador Railway Company receipts in December, 1960, amounted to colones 274,000 compared with colones 377,000 in December, 1959. Aggregate receipts from July 1, 1960, amounted to colones 954,000 (colones 1,215,000). Costa Rica Railway receipts for December, 1960, amounted to colones 2,267,623 compared with colones 2,060,061, an increase of colones 207,562. Aggregate receipts from July 1, 1960, amounted to colones 13,899,710 (colones 12,432,850).

Crowded trains

By placing the blame for crowded rush-hour trains on passengers, a new folder issued from Waterloo, although admittedly well produced and amusingly illustrated, is unlikely to endear the Southern Region of British Railways to its suburban customers. By defying the classic slogan to sales success—" The Customer Is Always Right "—it also marks a new approach to public relations, and one the result of which has already aroused resentment. Over and above all, it is unlikely to produce the desired result of " staggered " travelling times, for it has been read, in the great majority of cases, by those in whose hands the decision to " stagger " does not lie. This is recognised to some extent—the reader is adjured to " persuade " his boss in the matter. But it may well be thought that action of this kind would merely bring down on the employee's own head the resentment he himself feels against the railways. The Southern would do better to aim its campaign directly at employers.

Moncton hump yard

Situated on the isthmus joining Nova Scotia with New Brunswick and the remainder of the Canadian mainland, is the important junction Moncton. It has six major lines and a number of branches radiating from it. There are two alternative lines to Quebec and Montreal, one *via* Edmunston and the other, after throwing off branches to Tracadi and to Gaspé, *via* Rimouski. Then there is the line to St. John, whence there are two routes into the United States, while to the east are two more (*a*) to Halifax and Southern Nova Scotia, and (*b*) to Cape Breton and the ferry to Newfoundland. The sixth is to Prince Edward Island. It is not surprising, therefore, that this hub of traffic routes should be selected for the latest and most up-to-date marshalling yard in Canada. This is described elsewhere in this issue, and as well as being equipped with modern electronic brain, integrated data processing, closed-circuit television, radar, and two-way radio installations, it has a $2 million diesel shop with servicing at three levels, and a wagon shop also, with electronic-assisted rapid wheel changing.

Bridge improvement in the North East

Faced with the problem that modernisation of motive power, rolling-stock, and services necessitate an extensive programme of bridge renewal and replacement, the Civil Engineering Department of the North Eastern Region of British Railways has had to move fast and work out the quickest and most economical methods of carrying out this work while ensuring that results reach the same high standards of, and last as long as, the older constructions. This week, Mr. A. H. Jenkins, the Region's Assistant Engineer (Bridges), describes some of the work that has been done and explains the reasons for the various materials which have been used. His account also brings to light two examples of beneficial by-products of the work: that, through railway instruction in specific manufacture, local suppliers have gained considerable useful knowledge and that co-operative local authorities have obtained road bridges at little or no expense. These and similar incidentals to railway modernisation are often forgotten by those who criticise the British Transport Commission on grounds of expense.

Unfounded suspicion of signals

Fundamentally there is no mystery about the collision at Waterloo, Southern Region, British Railways, on June 3, 1960. Colonel D. McMullen's report, summarised on another page, makes it clear that the motorman of an incoming train passed the inner home signal at danger, and so collided sidelong with an outgoing express. But throughout the inquiry the motorman remained positive that this signal was green, and added that he and other motormen had not much confidence in the Waterloo signalling equipment. In these circumstances Colonel McMullen adjourned his inquiry and carried out exhaustive tests of all the signal and other circuits on which suspicion had been cast. On resuming his inquiry he stated publicly that the integrity of the equipment was beyond question. It was essential that such suspicions be allayed, to reassure both public and staff. This accident illustrates once more the importance of drivers obeying their proper signals, even when a gantry has two or more colour-light signals applying to adjacent lines.

Selling railway transport

In a revised edition of a booklet issued to its sales staff by the North Eastern Region of British Railways, extremely practical advice is given on how to sell. Although designed to help the railwayman, the pointers would be of value to aspirants in every type of business, for they include the age-old, but constantly forgotten, formulae to success: maintain a good appearance; develop confidence; cultivate a pleasant personality but stand your ground; listen and learn; know your job. These and many other characteristics of the efficient and successful businessman are listed in an eight-page booklet illustrated like its predecessor with lively line drawings. The text has been completely revised, and now forms a compact handbook in easily-assimilated style of all rail facilities available on the Region, together with brief but telling instructions on how to sell these services. It is an excellent booklet, and should be of great assistance to all concerned with furthering the sales efforts of British Railways in the north east.

Greater powers for " C " licensees

Speaking at the annual dinner of the Road Haulage Association, at Southampton last Friday, Mr. J. T. Turner, a National Vice-Chairman of the Association, described the recent decision of the Transport Tribunal, to allow a transport subsidiary of a furniture manufacturing company to accept return loads from outside concerns, as " the worst blow to the railways since

the invention of the internal combustion engine." Mr. Turner pointed out that the decision could have repercussions on the operation of over a million vehicles now operating under "C" licences, a development which would completely upset the licensing system, which had been designed primarily to regulate the amount of competition suffered by the railways from road transport. On behalf of its own members, the Association is taking the case to the Court of Appeal. It also is urging the Minister of Transport to amend the law. Mr. Turner believes that, if this is not done, the Minister's railway plans will be completely wrecked.

Design in transport equipment

"STATIONS like this make it a pleasure to travel." This comment in the *Daily Telegraph* on the new station at Harlow Town, Eastern Region, goes far to explain the importance of design of railway rolling stock, structures, and equipment. As such it was singled out by Mr. T. H. Summerson, Chairman of the Design Panel of the British Transport Commission and a Member of the Commission, in his recent paper to the Railway Students' Association. More people than ever before, he believes, are showing an interest in appearance. When the first diesel-electric locomotives were produced for British Railways, their appearance caused a demand for steps to be taken, as a matter of urgent public relations, to enable them to give the same impression of power and speed that had made the larger engines of the steam era so attractive. This was the genesis of the B.T.C. Design Panel. It was thereupon suggested that perhaps a stylist from a motor-car manufacturing firm be called in to devise a false front end, accentuate the streamlining, or even add chromium plating, to give a more dashing appearance.

That is not good design, nor is it the intention of the Commission. It is not good design, Mr. Summerson points out, to take the mechanical engineer's work at the point at which he might be said to have finished with it, and then to superimpose an extraneous surface treatment or covering. The designer must be brought in from the start, and must work closely with the mechanical, electrical, or civil engineer, as the case may be, to the finish. Apart from extremes, there is today an accent on style in architecture, furniture, and many other things readily recognisable as British and contemporary. The intention is that everything visible that appertains to the nationalised transport undertakings shall be in tune with it.

Design should preserve a reasonable symmetry and encourage a line which the eye may follow. For example, British Railways diesel and electric locomotives have their windows and other apertures as far as possible in line and, therefore, in harmony. Good design need not be cheese-paring. Economy in this context is not absolute but is related to commercial considerations and to market values, and must be directed to producing not only a purely functional article as cheaply as possible but also what the customer wants, and is prepared to pay for, at the most economical cost. Mr. Summerson emphasises a good point here. Having laid down the specification for a Pullman car, "with an eye clearly cocked at what well-to-do people (or at least those on generous expense accounts) want and will pay for," the designer, he states, produces the luxurious job as simply and as cheaply as possible in accordance with the specification. Not to do so would be bad design, because it would be bad management.

The exterior of the best British steam locomotives of the 1920s, with their obvious fitness for purpose, purity of line, and attention to detail, compares well with that of some engines of that period—but not of British design—on railways overseas. The design of British Railways equipment, therefore, must be simple, with maximum regard to economy in cost of construction and in that of use. It must pay attention to commercial considerations, eschew unnecessary effect, and be recognisably in accord with British contemporary taste.

Apart from its engineering features, design is an element of public relations. New, good manifestations of it, as in Harlow Town Station, are increasing public regard for British Railways and other nationalised transport. Besides new stations and trains, British Transport hotels are becoming recognised as among the best in the country. Comfortable, well-appointed station waiting-rooms are multiplying. All are of as good design as is possible, given the restrictions on rebuilding. Public memories of old trains and hotels and unpalatable refreshment rooms are being replaced by a much more favourable image. Neat, bright, up-to-date appearance, with physical comfort, can do more than anything to bring that about. Good design, moreover, enhances the morale of the staff. Only one thing will do them more good than the sight of new, well-designed equipment and buildings: hearing the public praise what it sees and can use.

Among examples of pleasing and effective design mentioned in the paper are the Ocean Terminal at Southampton, planned by the Southern Railway, and the Pullman diesel sets of the Western Region. Most of the new stations now appearing in various parts of British Railways are considered to be excellent, though sometimes marred by details such as "mean little litter-baskets, clumsy seats, or just ill-placed posters." New types of rolling stock of all kinds he believes to be a credit to the designers, though capable of improvement. It is important that they should be bettered "because some of them will still be in service in the 21st century, and we want them to look still up to date then."

The B.T.C. Design Panel has no responsibility for buildings, which are the concern of the B.T.C. and Regional architects. The latter have recently, as a body, drawn up a code of practice and a stock list of recommended designs, principally for station equipment, which will be of the greatest benefit to the Regions. With rolling stock, the former practice according to Mr. Summerson was for the Chief Mechanical Engineer "to sit for half a minute in a prototype seat and then pronounce upon it; and whatever was decided on that very unscientific basis went into the next few years' programme of carriage construction." Today specialist officers advise on the scientific design of seats, back-rests, and so on. Cleanliness of rolling stock is a problem. Older vehicles, with their many angles and cavities are very hard to clean; and the British travelling public leaves much more litter in vehicles and stations than do travellers in other civilised countries.

The C.N.R. in 1960

DESPITE the low traffic levels that plagued the railway industry throughout North America, the Canadian National Railways last year made progress with modernisation aimed at improved efficiency and flexibility of service. Technological advances, administrative re-organisation of the railway and marked progress in communications and greater co-ordination of rail and road facilities provided for increasingly efficient operation matched by important strides in sales development. Reflecting this progress the C.N.R. recently presented to the public a new trademark symbolising its role: movement of men, materials, and messages throughout the Dominion.

In his year-end review of 1960, Mr. Donald Gordon, Chairman & President of the C.N.R., points out that these improvement in plant and method contrasted sharply with the revenue position. Freight traffic revenues fell by more than 7 per cent, and passenger revenues by about 6 per cent. Gross revenues of Canadian National Telegraphs rose by 9 per cent to a record, and C.N.R. hotel receipts showed a slight improvement. The overall decline in operating revenues is estimated at 6·5 per cent, leaving the system with a disappointingly large deficit.

In goods traffic by rail there were increases in movements of ores and concentrates, pulpwood, and miscellaneous manufactured iron and steel products; but these were more than equalled by declines in carriage of grain, flour and other grain products, bituminous coal and other minerals. Completion in April, 1960, of a 10-year programme of substituting

diesel for steam traction, and the opening at Moncton, in November, of the first of four electronic hump yards marked progress in improving goods services. The new yards are expected to reduce by 75 per cent the time for making up trains.

Re-organisation of the system was effected so as to decentralise authority, bring administrative techniques up-to-date, and provide a sales and operations staff integrated at all levels. The three C.N.R. operating regions were replaced on January 1, 1961, by five: the Atlantic, St. Lawrence, Great Lakes, Prairie, and Mountain Regions. These are being sub-divided into 19 geographic areas as " business units." This re-organisation is to be completed during the current year. Purchase agreements were concluded in 1960 with four road haulage concerns, extending the C.N.R. road service by 15,000 miles, and an option was taken on a fifth company.

Despite these and other developments during the year, the Canadian National in its representations to the Royal Commission on Railway Transportation in November last pointed out that " much remains to be done before the company can bring its efficiency of operation to the point where it will be fully competitive with other forms of transportation." The need was stressed for major changes in legislation governing railway operations, to enable the company to adapt itself to changing conditions in the transport market as a whole. In a year marked by reduced revenues, the C.N.R. was faced with new wage demands by its " non-operating " employees. A system-wide work stoppage was averted by emergency legislation which provided for the maintenance of railway operation until May 15, 1961. This Federal Government intervention, Mr. Gordon adds, focused attention on the Canadian railways' difficulties. The burden they bear through the maintenance of statutory and related rates for the movement of grain and its products is becoming heavier in the light of reduced goods and passenger traffic in 1960. The Government moreover has stated that no general freight rate increases will be permitted pending a report of the Royal Commission on Railway Transportation. Higher costs of labour and materials have offset improvements in efficiency effected through capital works; and certain train services are not returning their out-of-pocket cost of operation and there is little prospect of their doing so in the future. As in Britain and elsewhere, the railways' representations for relief from the obligation to perform service at a loss are almost always being met by strong local opposition, even where patronage has almost disappeared.

As to passenger traffic the C.N.R. policy is to reduce the service on lines where the public has shown preference for other means of travel which are readily available and where there is no potential for increasing traffic. Because of the continuing decline in passenger revenues and the need for economies in operation, modifications were effected last year in the trans-continental passenger services. Facilities in the " Super Continental " were improved, and the " Continental " was transformed to provide for local traffic. The Montreal-Ottawa service was improved to provide more trains on a 2-hr. schedule.

In the sales department groups of specialist staff were formed to study rate-making, rolling stock, and service to customers, and to forecast traffic, set objectives for commercial development, and plan market surveys. The freight rate staff also was re-organised to enable a study group to concentrate on international, Canadian, and trans-continental rates. Amalgamation is under consideration of express and less-than-wagonload shipments as part of Merchandise Services, a new branch of the sales department set up to make the most efficient use of both rail and road transport. Expansion of piggy-back services resulted in a 25 per cent increase in revenues, and tonnage increased by 11 per cent over 1959. A total of 188 road vehicles for piggy-back service, including 25 refrigerator trailers, was purchased during the year.

To obtain maximum use of locomotives, regional motive power control bureaux were set up at Winnipeg, Toronto, and Moncton. The electronic Symington Yard at Winnipeg will be in operation next year. Integrated data processing, which will play a major role in hump yard operation, is being applied with success to other aspects of railway operation, such as tracing of wagons, revenue accounting, and operating and sales statistics. A 52-mile branch between Optic Lake and Chisel Lake in Northern Manitoba was opened last September to serve the Hudson Bay Mining & Smelting Co. Ltd. A 60-mile line to serve Mattagami Lake mines in N.W. Quebec, branching off from the Chibougamau line opened in 1959, is to be completed by the end of next year. C.T.C. was extended to a further 839 miles of track, mostly in Ontario and Quebec, and further extensions will be made this year.

Progress in communications included inauguration by the C.N.R. and Canadian Pacific of the Wirefax service between Montreal and Toronto and the start of the end-to-end train wireless service between Edmonton, Prince George, and Vancouver. Radio communication between train and wayside points was nearly ready for operation in the same area at the end of last year. Operation of end-to-end train radio is expected to begin shortly between Edmonton and Port Arthur.

Recent research by O.R.E.

IN the performance of overhead line systems of electrification, the section insulator plays an important part, particularly in view of the high speeds now demanded of this form of traction. An investigation of the behaviour of various types of section insulator under different service conditions has recently been carried out by the Office for Research & Experiment of the International Union of Railways, as reported in our issue of February 10. It is discussed in a recent Bulletin of the O.R.E., which also contains summaries of other interesting aspects of research work undertaken by this organisation.

Greater attention than has been given in the past requires to be devoted to the heating and ventilating arrangements of passenger rolling-stock to meet the needs of an increasingly-critical travelling public, and it is therefore encouraging to learn of the research being conducted on this subject by the O.R.E. The Bulletin contains a brief description of the main features of the Vienna Arsenal test installation, which has been built to carry out heating and air-conditioning tests on railway vehicles under controlled atmospheric conditions. Separate chambers are provided to enable vehicles to be subjected to static and dynamic tests. For the latter tests, equipment is installed to reproduce the air-flow conditions encountered by the vehicle under various degrees of speed, temperature, and humidity.

The power equipment of the test plant is capable of supplying the heating system, either steam or electric, and the air-conditioning system of the vehicle under test, as well as the fans, heating, cooling, and moistening installations for the external air-flow. A very comprehensive system of instrumentation is provided for measuring and recording the various quantities involved in the operation. The test station is shortly to be put into commission, and the results of the tests are expected to point the way towards improved heating, air-conditioning, and thermal insulation of passenger vehicles, with consequent reduced costs of energy supply and maintenance.

The Bulletin also contains a summary of a test programme organised for shock-recording apparatus. The programme was drawn up first of all to compare the characteristics of various types of apparatus and to determine the qualities which a reliable and efficient shock-recorder should possess. A ramming apparatus, designed to produce shocks of pre-determined values on railway vehicle buffers, was first used for these tests. Subsequently, a series of buffing tests were carried out, produced by the impact of a moving loaded wagon on a stationary loaded wagon. Combinations of different designs and types of buffers were used in these tests, which enabled maximum impact speeds to be determined at which the contents of the wagons suffered no damage.

Another example of useful research on the part of the O.R.E. concerns the protection of materials used in different branches of railway engineering. As described in the Bulletin, the investigation was divided into three categories, each undertaken by a separate committee. One of these dealt entirely with the chemical aspects of the matter, such as specifications and test procedures for paint materials. Another concerned itself with all questions relating to the protection of vans, wagons, and coaching stock. The third specialised in the protection of materials used for civil engineering applications.

The investigation covered a wide variety of problems connected with this subject. For example, the method of assessing the qualities of paints by artificial weathering processes was studied, with the result that, although this method enabled satisfactory materials to be distinguished from unsuitable ones with reasonable accuracy, it was found essential to subject the former materials to further exposure tests under natural conditions to determine those suitable for extensive application.

The preparation of surfaces for painting has also been examined in detail, as it has been recognised that this has a major effect on the durability of a paint application. So far as the actual application of paint is concerned, a study of various spraying methods at present in use is in progress to enable their characteristics to be compared. These methods include atomising by air pressure, and by vaporising an added solvent, and also electrostatic spraying.

On the question of stripping old paint from passenger coaches, the committee came to the conclusion that alkaline-based stripping agents were undoubtedly more economical to use than those based on solvents. On the other hand, the residue formed requires, because of its chemical action, special precautions to be taken for its removal, and adequate protection for staff engaged in the work.

Materials used for the cleaning of coach body-work have also come under scrutiny, as the result of which cleaning agents based on oxalic acid are considered to be the most suitable. The advantages of this form of cleaner include rapid removal of all dirt, except that of the coal-bituminous type, absence of adverse effects on the paint, and only very slight corrosive and toxic properties.

The Bulletin concludes by giving, in tabular form, the position at December 1, 1960, concerning the homologation of diesel engines, under O.R.E. regulations, for locomotives. It is unfortunate that no British-designed engine yet figures in the lists.

Railway results at the turn of 1960-61

BY A CORRESPONDENT

IN the last four-week period of 1960 British Railways originated 137,000 more tons of freight train traffic, but worked 67 million fewer ton miles than in the same period of 1959. Merchandise and livestock decreased by 35,000 tons and coal class traffic by 158,000 tons; mineral tonnage rose by 329,000 tons, or 7 per cent, but required the working of 11·6 million fewer ton miles and produced £52,000 less revenue.

A further decrease of £754,000 in freight receipts during the first four weeks of 1961 indicates a drop in forwardings of all classes of traffic. There was also a fall of £63,000, over 2 per cent, in parcels receipts, so that the railways may have to struggle harder than ever for business this year.

The total freight traffic originating in 52 weeks to January 1, 1961, was in round figures 249 million tons, an increase of 6·8 per cent on 1959. The Eastern, North Eastern and Scottish Regions accounted for 70 per cent of the additional tonnage but for rather less than half the extra 897 million ton miles which were worked. The three Regions, however, worked 1,553,000 more freight train miles, while the London Midland Region reduced its mileage by 167,000 and the Western by no less than 483,000. Over the whole system steam train miles were reduced by 4,805,000, or 4 per cent, while diesel train miles increased by 5,527,000 and electric train miles by 230,000.

Regrettably these changes slowed down freight movement. The all-line average speed of steam freight trains fell by 3 per cent to 9·16 m.p.h. Progress in the L.M. Region dropped to 8·74 m.p.h. and the Eastern Region figure of 8·88 was also well behind the North Eastern speed of 9·2 and Scotland's return of 10·7 m.p.h. Over the whole system diesel-hauled goods trains moved faster at 10·73 m.p.h., but this was due entirely to the North Eastern record of 21·27 m.p.h. and the Scottish return of nearly 12. London Midland diesel trains progressed at only 7·2 m.p.h. Neither can the Western Region speed of 8·9 m.p.h. be regarded as satisfactory. To complete the account of poor locomotive working, electric freight train speed was 2 per cent slower at 9·56 m.p.h. Both the London Midland and the Eastern Regions, which perform the bulk of electric freight haulage, worked fully 5 per cent fewer train miles in a train engine hr.

The general trend of operating statistics is not satisfactory. An increase in last year's train-load of 6 tons to 152 tons should not have hampered movement. In 1956 the train-load was 159 tons and a ton more in 1955. Last year the significant measure of freight train operation was 1,158 net ton miles in a train hr. against 1,183 in 1956. The Eastern Region led the way by working 1,293 net ton miles in a train hr. It also recorded 222 wagon miles in a train hr., compared with the general average of 211 and the Western figure of 192, the lowest for any Region. The decline of this statistic over the last five years calls for thorough investigation.

At January 1, 1961, British Railways had an operating stock of 12,648 steam locomotives, with 2,498, or 19·7 per cent, under repair. Of 590 diesel and mechanical locomotives, 65, or 11 per cent, were unserviceable. The diesel-electric stock of 1,961 units was in a worse case, 318 or 16·2 per cent being out of action. Electric locomotives gave the worst showing of all, with 29 out of 135 units—more than one-fifth—under repair. Thus out of a total stock of 15,334 units of all classes, 2,910, or nearly 19 per cent, were useless.

The wagon position, on the other hand, improved. Of a stock numbering 961,947 freight vehicles, 51,393, or 5·3 per cent, were under repair on January 1. Unfortunately of 29,808 passenger carriages hauled by locomotives, 3,245, or 10.8 per cent, were under repair. Of 3,753 diesel multiple-unit vehicles, nearly 10 per cent were not fit to run, and 497 of 5,652 electric multiple-unit cars were unserviceable. In addition, the railways had on their hands 67 diesel multiple-unit and 778 electric multiple-unit vehicles which were waiting the start of new schemes—a substantial increase in working costs without any gain or revenue.

In 11 months of 1960 the railways originated 931,570,000 passenger journeys, 35,106,000, or 3·6 per cent, fewer than in 1959. First class travel was 7·7 per cent down, while second class declined by 3·5 per cent. The Southern Region, which started nearly 40 per cent of all journeys, lost 7,549,000, or 1·9 per cent, of its 1959 passengers, including 563,000, almost 8 per cent, of those who took first class tickets. The London Midland fared worse, carrying 9,717,000, or 4·7 per cent, fewer people; of that number 638,000 used to travel first class. The Western Region was exceptional in recording 68,000 more first class journeys, but 7,595,000 fewer second class—the highest percentage decline of 7·6 per cent in any Region. A decrease of 2,966,000 passengers, or 5·5 per cent, in the North Eastern was disappointing; it was twice the loss of business in Scotland where industrial activity has been at a lower level recently.

In contrast to the reduction in the volume of passenger movement, takings during 11 months to November rose by £10,223,000, or 7·8 per cent. First class travel contributed £1,622,000, over 11 per cent, to the additional revenue. The average first class fare was 34·1d. higher, while the second class passenger paid 3·35d. more for a journey. There is no doubt that both classes of passengers get good value for their additional payments.

LETTERS TO THE EDITOR

THE EDITOR IS NOT RESPONSIBLE FOR THE OPINIONS OF CORRESPONDENTS

HIGH-POWER ELECTRIC LOCOMOTIVES

February 15

SIR, I notice in your issue of February 10 reference is made to the new high-power Bo-Bo electric locomotive of the Swiss Federal Railways. I would like to add just one detail which is sometimes overlooked when making comparisons of different types of locomotives.

Decisive for the lay-out is the speed at which the one-hr. rating should be developed; and again, this speed should be put into relation with the maximum permissible service speed. A fair comparison considers two or more locomotives of approximately the same top speed and again of approximately the same speed at which the one-hr. rating is being developed. This seems to be the case in the table in my letter published in your February 17 issue, for the type " A " of the British Railways and the new type Bo-Bo of the Swiss Federal Railways.

Yours faithfully,

B. STEINER

Walchestrasse, 27,
Zurich 6.

BRITISH RAILWAYS MOTIVE POWER

February 15

SIR, Referring to Mr. Casserley's letter in your issue of February 10, where he states that it seems impossible to obtain reliable figures of relative costs of steam and diesel operation.

May I say that, to my mind, if a selected 12 week-day statistical record were taken, and with the initial costs of the locomotives concerned, a practical comparison of costs between steam and diesel traction should be obtained.

Yours faithfully,

ROBERT W. LEWIS
(Railway Superannuitant)

" Beth-El," 104, Leggatts Way,
Watford, Herts.

COMMUTER TRAFFIC

February 20

SIR, The difficulties with which the railways serving New York have had to contend during the last half-year will have been reflected in a feeling of sympathy by railwaymen in many continents and particularly so in Britain. Strikes on the Long Island and on the Pennsylvania Railways last year caused grievous financial losses to those companies and their season-ticket holders—or to use the American term commuters—had much to put up with; they also merited sympathy.

The more recent January strike, originating with tugboatmen and crews on the railway-operated Hudson river ferries, successively closed down the ferry services and the train services, based on the Grand Central terminal, of the New York Central and the New Haven Railroads. To add to the difficulties, severe weather, with far below zero temperatures and heavy snowfalls with 10 ft. drifts—a record for modern times—coincided with the strike. Press reports from New York have stated that some 100,000 commuters had to find alternative means of getting to and from work, the New Haven services accounting for 30,000 of them and the New York Central's routes for another 40,000—the balance presumably normally use the Hudson ferries. In addition, many long-distance trains on the New Haven and on the Central had to be cancelled; strike pickets were active as far west as Cleveland.

Unsuccessful efforts were made on January 21 to bring to a halt Pennsylvania and Long Island services, which are said to carry some 100,000 suburban commuters on week-days. According to these figures the total rail commuter traffic into Manhattan Island is, therefore, somewhere around the 200,000 mark daily.

It is of interest to contrast this figure with the comparative one for London, since the Southern Region alone carries more than 400,000 passengers in and out of London every week-day. Our national characteristic is to play down our achievements and to exaggerate blemishes. Perhaps this suburban movement is one of which we may be legitimately proud.

Yours faithfully,

C. E. R. SHERRINGTON

Byways,
20, Queens Road,
Belmont, Surrey

INTER-REGIONAL PASSENGER SERVICES

February 13

SIR, I have just watched British Railways' new ship *Caesarea* arrive in Weymouth from the Channel Islands ahead of time. Soon she will be joined by the *Sarnia* and the renovated *St. Patrick*. The quay has been lengthened in the busy little harbour. A third track is to be laid on the pier. New transit buildings are in hand. All these improvements are intended to win back Channel Islands passengers from the air.

Train services from two-thirds of Britain to Weymouth are deplorable. Except on summer Saturdays in the peak season South Wales, the Midlands, and the West are virtually cut off from the services provided by the new ships. The Iron Curtain between the Western and Southern Regions has dropped. Now that connections between these Regions *via* Reading have virtually ceased, except by stopping trains, passengers from Birmingham to the Channel Islands must travel *via* London, with the inconvenience of crossing from Paddington or Euston to Waterloo for the boat train. Those from Bristol leave Bristol Temple Meads at 7.40 p.m., and change at Westbury (8.50 - 9 p.m.), whence a diesel train takes 2 hr. 10 min. for the 60 miles to Weymouth Town. There they must take a taxi or walk to the quay, from which the sailing is at 2 a.m. Things are even worse for travellers from South Wales and the West of England.

The fine new vessels will be financial failures unless the traffic and commercial departments concerned think again. I have raised the matter with them ; eyebrows have twitched, but that is all.

Passengers for stations in Dorset who travel from the Midlands by the " Cornishman " have to wait 2 hr. in Bristol for a diesel connection. Many do not wait ; they go by motorcar.

Yours faithfully,

GILBERT DALTON

Stoberry, Faircross Avenue,
Weymouth

" ALL CHANGE "

January 27

SIR, Reference is made in your issue for January 20, giving The Rt. Rev. John Heenan as Roman Catholic Archbishop of London.

His Grace is the Roman Catholic Archbishop of Liverpool.

Yours faithfully,

P. LYNCH

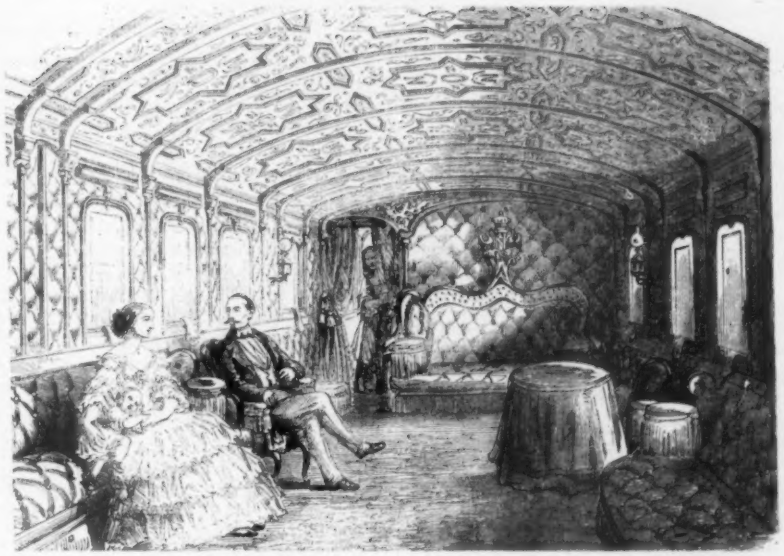
51, Hillside Avenue,
Monks Road, Lincoln

The Scrap Heap

Second Empire splendour

One of the most ornate railway saloons was designed by the architect, Viollet-le-Duc, for the Paris-Orleans Railway a century ago, for Napoleon III and the Empress Eugénie. The keynote of the interior décor was the Imperial crown and eagles.

The upholstery was green silk damask relieved with red and gold. The ceiling was of reinforced fibrous plaster, white with gold beading. Among the rosewood tables was one for whist. The adjoining vehicle in the Imperial train was an open saloon for travel in hot weather. The dining car interior was lined with scarlet velvet. One passenger, Queen Victoria, was so pleased with these coaches that she exclaimed " Why can we not have railway saloons so beautiful ? "



Napoleon III with the Empress Eugénie and the Prince Imperial in the Imperial saloon

115 years of passenger services

The New York Times of February 5 sadly recorded the departure of the last passenger trains on the Lehigh Valley Railroad. That company, which serves the territory between New York City and Buffalo by way of Bethlehem, Wilkes Barre, Sayre, and Ithaca, was long famous for its " Black Diamond " express, which at one time carried through cars for Chicago and Toronto, though its importance lay primarily in the haulage of anthracite.

Though certain principal cities on its route possess alternative passenger train facilities, other centres are now deprived of such services, for instance Ithaca, where Cornell University is located, and these must now rely on bus and air services. It is curious that, at the time of this passenger service demise, upper New York State suffered from the severest cold snap for many years, with temperatures as low as 23 deg. F. below zero—even Cayuga Lake was extensively frozen. The punctuality of the " Black Diamond " express, illustrated on this page, was renowned. In country districts it was said that one's watch could be set when its locomotive sounded the level-crossing approach warning signal.

Cushioned ease

The Midland abolished second class in 1875 and built third class coaches as comfortable as the seconds of some companies; other railways gradually followed suit. . . . The last vestiges of second on the Continental boat trains did not die out until 1956, when the old third class was renamed second in Britain as in many European countries. But whatever the name, the exceptional comfort of British third (or recently second) class carriages goes back to the Midland building programme of 1875. It is not very likely that we should have travelled so comfortably if British railways had been nationalised by 1870. Let us thank competition for this and remember James Allport [General Manager of the Midland Railway, 1853–57 and 1860–80, and for two periods a Director of the company] as we sit down on the cushions. —*From " Railways," by G. C. Allen* (*Basil Blackwell*, 8*s.* 6*d.*).

[Second class accommodation was provided in L.N.E.R. London suburban trains until 1938—Ed., *R.G.*]

The " Black Diamond " express in its heyday on the Lehigh Valley Railroad

OVERSEAS RAILWAY AFFAIRS

FROM OUR CORRESPONDENTS

SOUTH AFRICA

Narrow-gauge stock purchased

The conversion of the narrow-gauge lines in South West Africa to the standard 3 ft. 6 in. South African gauge has released narrow-gauge rolling stock which can be used on the few narrow-gauge lines still functioning. The South African Railways Administration has now bought five locomotives and 50 bogie trucks from the Tsumeb Corporation at a cost of £50,000. The stock will be used between Port Elizabeth and Avontuur. Other South West African rolling stock, the property of the South African Railways, will be transferred for use in Natal and the Cape Midlands.

RHODESIA

Examination for firemen

Results were announced recently of the first examination to be set for a multi-racial group of railway firemen. The young men were all recruits to the service about three months ago and except for periods at the training centre in Bulawayo they have been working at various depots as shunting firemen. There were 15 passes out of 19 candidates who sat the examination which was held on February 4. The 15 passes included Europeans, Africans, coloureds and one Indian. Those who failed may have two attempts at passing at intervals of three months. Sixty per cent of possible marks was regarded as the minimum for a pass ; one European obtained 81 per cent, and he was followed by one Euopean, one African and one coloured who each obtained 78 per cent.

VICTORIA

Movement of surplus wheat

The Victorian Railways has moved to bulk storages more than one-third of the surplus record wheat harvest that country silos cannot hold. Some eight million bushels have been railed to bulk installations at Dunolly, Geelong and Marmalake. Almost 700 railway wagons, each holding 800 bushels, are being hauled each day from roadside stations to the storages.

Lengthening of overpass

Another standard-gauge reconstruction project, the extension of the Hume Highway overpass between Broadford and Tallarook, commenced recently. The overpass is being lengthened by 45 ft. to allow the new standard-gauge railway line to pass underneath. At present, the overpass crosses the double tracks of the 5 ft. 3 in. Melbourne-Albury line, but an additional opening is required for the standard-gauge line.

INDIA

Broad-gauge access to Ranchi

Completion of the Chandrapura-Muri-Ranchi section of the South Eastern Railway affords through running between the hill station of Ranchi and the rest of the broad-gauge system. Passenger trains now run daily between Ranchi and Howrah (Calcutta) and Patna.

CAMBODIA

Delivery of wagons

Five countries were involved in the recent delivery of railway wagons presented by Australia under the Colombo Plan. The wagons were manufactured in Australia, assembled in Singapore, hauled through Malaya and Thailand into Cambodia, where they were handed over for service with the Royal Cambodia Railways. The wagons represented the final instalment of a gift to Cambodia of four passenger coaches and 75 goods wagons with a total value of £A500,000. The 30 wagons which made up the final instalment were assembled by the Singapore Harbour Board. They were then formed into a train and hauled across Singapore, through the length of Malaya, through Thailand and Cambodia to Phnom Penh.

BRAZIL

Progress with improvements

The Mineira System has finished enlargement of five tunnels. Improvements to the Barra Mansa to Angra dos Reis line are nearing completion. This will enable the Rede Mineira to carry part of the iron ore from Minas Gerais to the coast, returning with coal for Volta Redonda. Sixty-seven miles of the line have been electrified and all worn or light rails have been replaced.

On the E.F. Central do Piaui, military engineer units have completed construction of the section connecting Piripiri and Campo Maior and continuing to Capitao de Campos. The North Western of Brazil Railway re-

SNOW CLEARANCE IN CANADA

Six-ton petrol locomotive, fitted with rotary snow broom, clearing nine-mile narrow-gauge line at the Canadian Industries Limited explosives plant

cently finished laying heavier rails and strengthening the track over 300 miles of route, thus improving communications between Sao Paulo and Mato Grosso. Marshalling yards on this railway have been enlarged and 38 diesel-electric locomotives purchased, doubling carrying capacity. Improvements to the Linha do Centro line of the Central Railway enabled mineral traffic to be increased to 3·6 million tons during 1960.

SWITZERLAND

S.F.R. higher working surplus

Preliminary figures show that traffic receipts of the Federal Railways in 1960 were frs. 992·2 million, which with miscellaneous receipts makes a total of frs. 1,075 million. Total expenditure was frs. 777·9 million, so that net receipts for the year were frs. 297·1 million, or frs. 76·8 million more than for 1959. The number of passenger journeys was 225·6 million, an increase of 2·4 million compared with the previous year. The total tonnage of goods and postal traffic was 29·8 million, a rise of 4 million.

HUNGARY

Increase in rolling stock

Rolling stock on the State Railways was increased last year by 8,000 goods wagons, 100 diesel locomotives and rail cars, and several hundred passenger coaches.

Rolling stock for USSR

In 1961, the Gyor Wagon & Machine works will continue to supply a considerably quantity of railway coaches to the Soviet Union. These coaches are of light construction, and fitted with bogies considerably lighter than those used previously. The reduction in overall weight has been achieved by improvements in body structure and the use of the lighter bogie. The second class, broad-gauge coaches for long distance service, have 32 seats and a maximum speed of 87 m.p.h. The underframes are welded. Cylindrical coil springs serve as roller bearing guides. Coaches and body frame are made of electrically-welded steel plates and shapes. Each coach is fitted with a separate axle-driven generator and a 300-Ah. 54-V. acid accumulator.

USSR

Murmansk-Pechenga railway

Traffic has been opened on the 100-mile Murmansk-Pechenga railway, the most northerly line of its kind in the world. Built beyond the Arctic circle, it has opened access to big nickel ore deposits. With 340 bridges and bridge crossings, the line was a difficult engineering project. More than half of the line is curved because of rivers, marshes, and lakes.

PUBLICATIONS RECEIVED

Kempe's Engineers' Year-book, 1961. Two vols. London: Morgan Brothers (Publishers) Limited, 22, Essex Street, Strand, W.C.2. 7 in. x 4¾ in. x 1¾ in. 1,324 pp. and 1,408 pp. Illustrated. Price 87s. 6d., postage extra. Revised information is given in almost all the 84 sections of this, the 66th edition. The sections concerned specifically with railways are those in Vol. 1 on permanent way, by Mr. C. L. Heeler; steam locomotives, by Mr. H. Holcroft; diesel locomotives and railcars, by Mr. J. L. Koffman; electric traction, by Mr. W. J. Arnold Sykes; rolling stock, by Mr. S. G. Smith; brakes, by Dr. I. G. Moore; and signalling, by Mr. O. S. Nock. The 47 pages devoted to steam locomotives include matters such as loading gauges and air resistances, relevant to all types of traction. The nine-page section on diesel traction is comprehensive though necessarily condensed. A brief account is given of British Railways electrification policy and of characteristics of the single-phase, 25-kV., 50-cycles system.

Financing Industrial Equipment. A new method of financing major items of industrial equipment is described in a booklet, " Machine Life Finance," issued by Engineering Finance Limited, 29, Pall Mall, London, S.W.1. For simplicity, use is made of a long-term hire purchase agreement ; the equipment is in normal cases the only security, but the finance charges are calculated on the reducing balance outstanding at a rate linked to bank rate. Payment can be made out of retained earnings and spread over a period. When delivery of large or costly items of equipment is a matter of several months, Engineering Finance Limited is prepared to make progress payments to the manufacturer. A concern may exercise its right to surrender equipment at any time, provided two-thirds of the balance financed has been repaid. These arrangements are designed to apply to equipment with a long working life such as machine tools, cranes, and electronic computers.

Railways: British Railways from their Beginning until 1960. By G. C. Allen. Oxford: Basil Blackwell, 49, Broad Street. 7½ in. x 5 in. 112 pp. Illustrated. Price 8s. 6d. Although one of the publishers' series of pocket histories, this is really an entertaining miscellany. History is told with numerous digressions. Some text-book information is given, such as the table of Whyte locomotive wheel arrangements, but the greatest appeal will be to those with existing knowledge of British railway history and practice. The questions in the list " Some Things to Do " will tax the most informed enthusiast. Railway officers will find food for thought here and there in the comments on present developments. The choice of illustrations, largely of unusual features, will disappoint some readers, and the separation of captions from pictures is not helpful.

Esso Magazine. The winter 1960-61 issue of the *Esso Magazine*, published by the Esso Petroleum Co. Ltd., 36, Queen Anne's Gate, London, S.W.1, contains an article " Fuel Policy in a Free Economy." Re-printed from *The Manager*, this maintains that oil reserves are ample for foreseeable needs until nuclear power becomes the main source of energy, and that market criteria, therefore, should be the guiding principles of fuel policy. Butyl rubber, to be manufactured in Britain by Esso, and its applications are the subject of another article.

Fluid power systems. A 32-page brochure issued by Hydraulics & Pneumatics Limited outlines the principles, functions, and potentialities in industrial applications of hydraulic and pneumatic power systems, with some details of the equipment available. Both types are manufactured by the firm, and comparative costs are given. The style is clear and concise. This is the first of a new series of publications intended to help non-technical people engaged in industrial administration. Copies may be obtained from Hydraulics & Pneumatics Limited, Wulfruna Works, Villiers Street, Wolverhampton.

Hotels and Restaurants in Britain. The 1961 edition of *Hotels and Restaurants in Britain*, issued by the British Travel & Holidays Association, gives information on over 4,000 hotels in Great Britain and Northern Ireland. As in previous editions, there is a description in gazetteer form of towns and villages where selected hotels are located ; lists of London and provincial restaurants ; route maps of British Railways and the L.T.E. Underground; and maps of tourist areas of Britain. Copies, price 6s. (postage 1s.), may be obtained from principal booksellers or from the British Travel & Holidays Association, 64-65, St. James's Street, London, S.W.1.

MODERNISATION and overbridge replacement

Quick, economical, and sound methods devised for dealing with extensive bridge work necessitated by modernisation

by A. H. JENKINS, *Assistant Engineer (Bridges), York, North Eastern Region, British Railways*

To AN engine driver, a bridge is a wall with a large hole through which his train must thread its way, and this simple fact has governed the main dimensions of bridgeworks since the earliest days of railways.

To be sure that the train passes safely through, the surrounding margin of space must be sufficient but in the interests of economy, the allowance must not be over-generous.

As this marginal requirement has been roughly constant from the earliest days to the present, the standards of width and height of bridge openings have progressively increased with the demand for bigger locomotives but, as bridge structures are relatively long-lived, sooner or later the time arrives when the shoe begins to pinch, and the conflict between locomotive and bridge becomes acute. Modernisation of a route merely quickens up the demand for reconciliation on a larger scale.

Past attempts to provide additional headroom at bridges by lowering the track have been widespread and, with the high speeds and modern means of propulsion now being considered, the conclusion is inescapable that many bridges carrying roads or paths over the railway are no longer adequate—the hole is no longer big enough.

What is usually found, roughly every three quarters of a mile and interspersed with more recent bridges, is a centenarian brick arch with a dip in the underlying track, a few inches only of ballast, and a clear headroom of 14 ft. 6 in. or so.

Minimum requirements are to take out the "slack" in the rails under the bridge, provide additional depth of ballast, a clear headroom of 15 ft. above rail level and, if the route is to be electrified, an additional 1 ft. 2 in. for overhead wires.

Many replacements necessary

The task is essentially one of replacing a brick arch by another structure with greater clearance, raising the road several feet to suit, satisfying everybody concerned, and then multiplying the problem many times and with many local variations.

In these circumstances, it is often the case that the underside of the proposed bridge is planned at a position only a few inches below that of the existing road surface. As many of these bridges are hump-backed, with steep slopes, it will be appreciated that the bridge designer tends to be squeezed between the pressure of the modern clearances below and the demand for easy road contours above.

Typical example of old bridge no longer adequate for modern conditions

There have been many other problems. To provide the surveys and technical drawings necessary, the technical staff had to be augmented and the additional engineers recruited were, of necessity, mainly young graduates and students with little experience of bridge design.

Simplicity at every stage was therefore essential, not only from the point of view of technical design, but also from that of supervision, following up, checking the work done and maintaining speed of production.

Choosing the material

The valuable modern composite material known as "prestressed concrete" has the advantage that it can form a thin bridge but, at the times we are considering, only a very limited number of concerns was capable of manufacturing the beam units for bridges of this type within a reasonable distance of where they were required, and a failure of only a few beams under test could make the difference of a month's delay on a tight job schedule and two erection possessions instead of one. Prestressed concrete was ruled out in the initial stages mainly for this reason and for the reason also that skilled technical supervision during manufacture could not be spared from the more urgent work of designing bridges on the drawing board.

Fabricated steelwork was ruled out by delivery dates of up to two years or more, and no time or labour was available for the production of the relatively complicated detail drawings, necessary in the manufacture of such bridges.

Thus it was that, on the North Eastern Region, the standby was the steel joist-in-concrete slab, irreverently referred to by generations of engineers as a "pudding." It had the advantage that, although apparently wasteful in tonnage, the beams were the cheap raw material of bridging, and available in the common standard sizes. They could be ordered far in advance from various sources before detailed drawings were made. If need be, they could be erected by semi-skilled labour and, at a pinch, without a crane.

The completed bridge has almost as great a reserve of strength as the brick arch and apparently lasts as long. It lent itself to simplicity of conception in both design and construction for, after demolishing the old arch and raising the abutment walls to form a prepared flat seating, a number of steel I-shape beams were placed to span the gap, side by side, and about 4 to 6 in. apart.

Quick, economic, and lasting construction

Flat timber-boarding could be slung against the undersides to form shuttering, and wet concrete brought to the site (already mixed in special lorries) to be tipped on and between the beams and allowed to solidify into a flat strong deck; some crossbars also being added to tie everything together.

The addition of shaping concrete for curving the road surface, simple waterproofing, a tarmac wearing surface, brick parapets, and simple concrete curbs completed the typical bridge deck. Minimum design, minimum supervision, minimum specialised materials or trades;

Typical demolition by explosive

bridges built cheaply and quickly to last 100 years; that was the basic formula.

The original arch was removed without ceremony. It was blown up by orthodox explosives, by a proprietary process using explosive gas cylinders, or by lifting the stripped arch ring by crane or cranes until it collapsed. The methods depended on circumstances and were equally effective.

After many bridges of the above type had been built, local concerns began to set up prestressed concrete casting beds in greater number, the Region's Inspectorate began to obtain a better knowledge of manufacture, and the generally resulting output became more consistent and reliable. In the initial stages it was not unknown for suppliers to seek the advice of the Commission's technical staff on manufacturing problems in an effort to reach the standards laid down.

More prestressed beam bridges

As the first batches of steel joists were used up, more and more prestressed beam bridges were built. To a limited extent they had been used in parallel beam form from the beginning, but now that they were more readily available, it was found that one of the main advantages was the ease with which they could be manufactured with a curved top surface. The great value of this was that they fitted the road better and thus reduced the amount of road lift required. Once steel joists had to be shaped in any form, the advantage of cheapness and simplicity of the steel beam was lost.

Reference has been made to the almost invariable necessity for lifting the road surface, and the often difficult problems involved in this work. Lifting the road surface of a hump-back bridge by only a couple of feet affected whatever was situated at the toe of the approach road slopes perhaps 150 yd. distant for, to maintain an approach gradient of 1 in 20, an additional 40 ft. must be added to the toe of the slope. This might involve a farm gateway, a side road, a cellar opening, and a station weighbridge at the four key toe points. In addition, the County Surveyors and other road engineers could not be expected to welcome any worsening of road traffic conditions.

Better sighting conditions

The saving factor proved to be that the old hump-back bridge crossings, made in the days of the horse and cart, were so badly shaped that a new arrangement of slopes and curves often could be provided to give better sighting conditions with the new bridge than with the old. This, with the slimmer forms of construction, greatly simplified what at first seemed a very difficult problem.

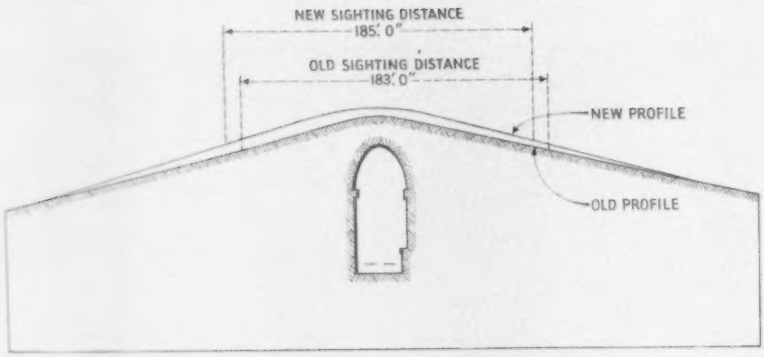
New outlook

It was at this stage that the bridge designers reorientated their outlook. Instead of starting to design a bridge, their first step was now to design a road surface. The challenge was to provide the same or increased sighting distance for motorists with 3-ft. 9-in. eye level, without seriously worsening the approach gradients.

How well we succeeded is seen by the typical diagram reproduced on the next page. Road engineers, being realists, usually accepted the new curve together with other minor improvements to the roads which it was found possible to introduce.

The submission of the new road profile to the appropriate road authority for formal approval then became the

Replacing a bridge by the method described on page 218



Old and new road profiles in a typical bridge reconstruction

first step in the final design of a bridge.

Relationships with road authorities were almost invariably good, and Councils frequently took the opportunity to widen the bridge at their own expense. It was quite common for the road works and increased fill on the road slopes to be carried out by the Council using its own labour.

The raising of the slopes often required the negotiation of additional land by the Regional Estates & Rating Surveyor, and in some cases retaining walls or toe walls had to be provided. A useful technique on the approaches was to provide a rough concrete dwarf wall at each kerb line, shaped to the new slope, to confine the new filling material. Once the road profile was agreed and the interests of the gas, water, electricity, and other service authorities had been met, the detailed design and construction went ahead.

Co-operation with local Council

Most of the bridges were constructed by direct labour by the District Engineer's staff with the assistance of specialist contractors and the Local Authority. During periods of construction, traffic diversions and temporary closure of roads were arranged through the local Council, and consideration by local authorities went far to ensure the success of many of the works carried out. This mainly resulted from realisation that a rail bridge to the railways was a road bridge to the road authority, and that the bridge should, therefore, be designed as a rail-road crossing and not simply as a railway bridge.

In the event, we found that we could carry out quite valuable improvements to road sighting, widths, corners, capacity, and superelevation, with little cost to ourselves, all of which tended to improve our relations with those responsible for our roads.

Earlier reference has been made to the use of prestressed concrete—that is concrete beams reinforced with high tensile steel wires. This material was first used mainly for simple low-capacity bridges but, later, the tops were curved to the approximate forms of the road surfaces. This practice reached its limit in certain farm bridges where the lower surface of the bridge was also curved.

The advantages of cambering the bridge in this way were also carried through to the larger plate girder bridges, where a 100-ft. span welded plate girder bridge might be cambered about 10 in. In short, it may be said that most of our bridge structures now follow the shape of the road and in one particular case the 100-ft. main girders were not cambered, but are appreciably cranked (from about one-third point), to accommodate the difficult road levels.

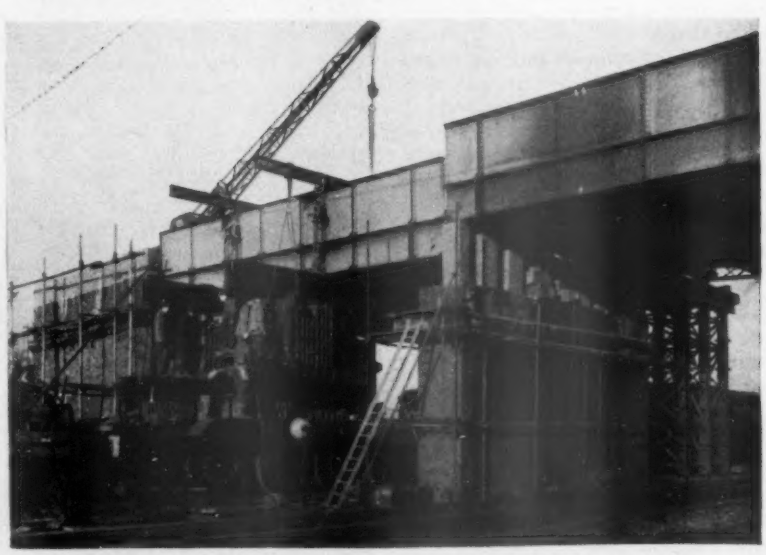
While the great majority of bridges of small clearance are brick arches, there are also cases of slab or girder bridges which are capable of being lifted bodily to their new positions, as shown below.

Costs

The unit costs did not vary very much and, for the typical small country bridge over two tracks replacing an arch, and with a road lift of one or two feet, this worked out to about £500 for each foot width of roadway, measured between parapets and including the approach works.

The number of overbridges of this type on the North Eastern Region reconstructed under modernisation authorities since 1957 is 47 and this, we would claim, means 47 good road bridges as well as 47 good railway bridges—a point one sometimes tends to overlook.

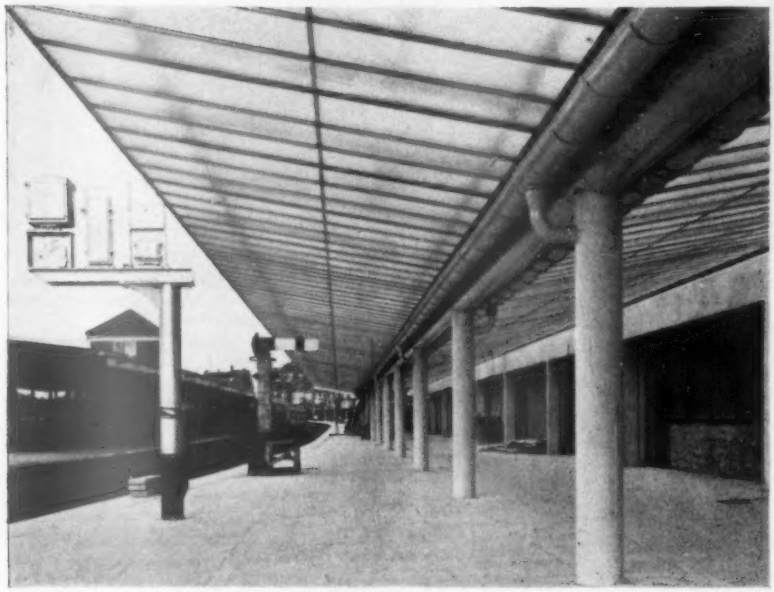
Slab bridge with curved lower surface



Mobile jacking platform made from locomotive frame lifting a bridge

CANOPY PLATFORM ROOFING at Plymouth North Road

Reconstruction of roofing over platform 2 with tubular steel columns, beams and truss frames



New roofing complete with underhung glazing

A NEW umbrella-type canopy roofing is being built over a 760-ft. length of No. 2 platform at North Road Station, Plymouth, British Railways, Western Region. This consists essentially of a line of 12-in. dia. tubular-steel columns carrying a series of 18-in. dia. longitudinal tubular beams supporting tubular-truss transverse frames. From loose purlins between the frames aluminium glazing bars are suspended to carry ¼-in. wired-glass.

The structure is divided into 26 bays and the work is being carried out in three stages to synchronise with the progress of construction work on the main station building. The first stage involved the erection of 10 bays between the middle of March and May last, the steelwork having been previously welded into units in the supplier's workshops. Also before erection, mass-concrete bases were prepared with circular holes to receive the feet of the 12-in. columns.

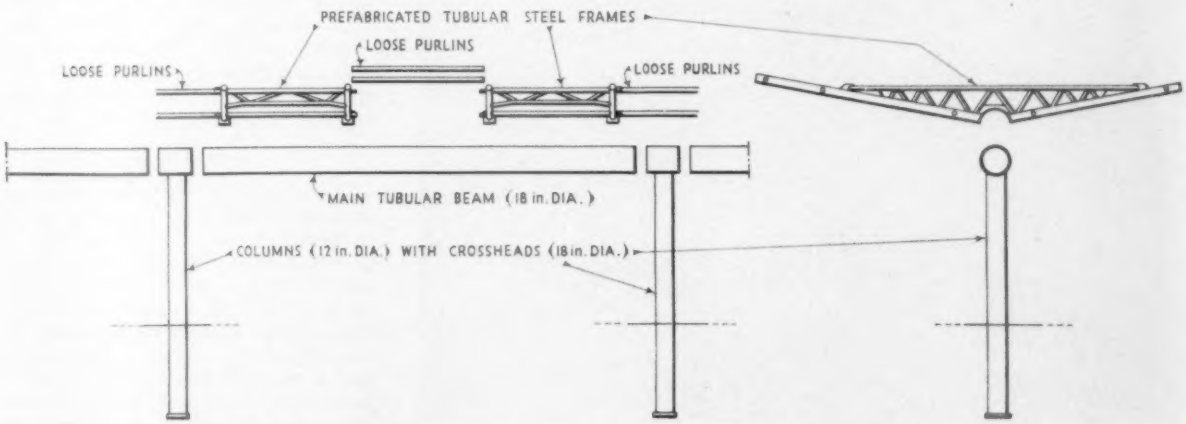
The columns for five bays, each complete with a short 18-in. dia. crosshead welded to it, and the 18-in. main longitudinal beams, were placed by locomotive crane on prepared supports on the platform, the ends of the beams registering with the column-crossheads to which they were subsequently welded.

The already fabricated main-frame trusses—in end-elevation forming with the columns a slightly eccentric Y—were next placed on the beams by the crane, and their saddles were welded to the beams; the purline split-cups and flashing plates were also welded up. In all these operations the equivalent of some 280 single-run welds were made by two specialist welders in 232 man-hr.

Fixing of glazing bars

A walkway and cast-iron gutters were then fitted and the whole structure so far completed was painted. Meanwhile another five bays were erected in similar manner. When the painting of the first five bays was nearly complete, a start was made on the fixing of the glazing bars to the purlins; a six-man gang fixed 25 bars a day. Some difficulty was at first experienced as there was slight distortion in the trussed frames despite their having been welded on jigs. This was overcome by slotting the holes in the glazing bars, and subsequently sections have been assembled on improved jigs. Glazing-bar hanger brackets are also being re-designed to allow of vertical movement by slotting the bolt-holes. Pressed aluminium fascias and flashings were fixed to the ends of the glazing bars.

The work is being carried out under the supervision of the District Engineer and the steelwork is being supplied by Tubewrights Limited, of Newport.


PREFABRICATED TUBULAR STEEL FRAMES
LOOSE PURLINS
LOOSE PURLINS
LOOSE PURLINS
MAIN TUBULAR BEAM (18 in. DIA.)
COLUMNS (12 in. DIA.) WITH CROSSHEADS (18 in. DIA.)

Side and end elevation of tubular structure, showing gap where crossheads and beam will be welded

Moncton Yard looking west, showing the hump in the centre, diesel depot top left, and wagon depot right

NEW HUMP YARD at Moncton, Canadian National Railways

Freight classification yard, built at a cost of $15 million, handling import and export traffic through Halifax and St. John

THE importance of Moncton as a Canadian National Railways traffic centre is explained in an editorial note on another page. With long- and medium-distance traffic coming in from six directions, but originating from many more, not to mention branch lines, a large and efficient concentration and classification yard is essential.

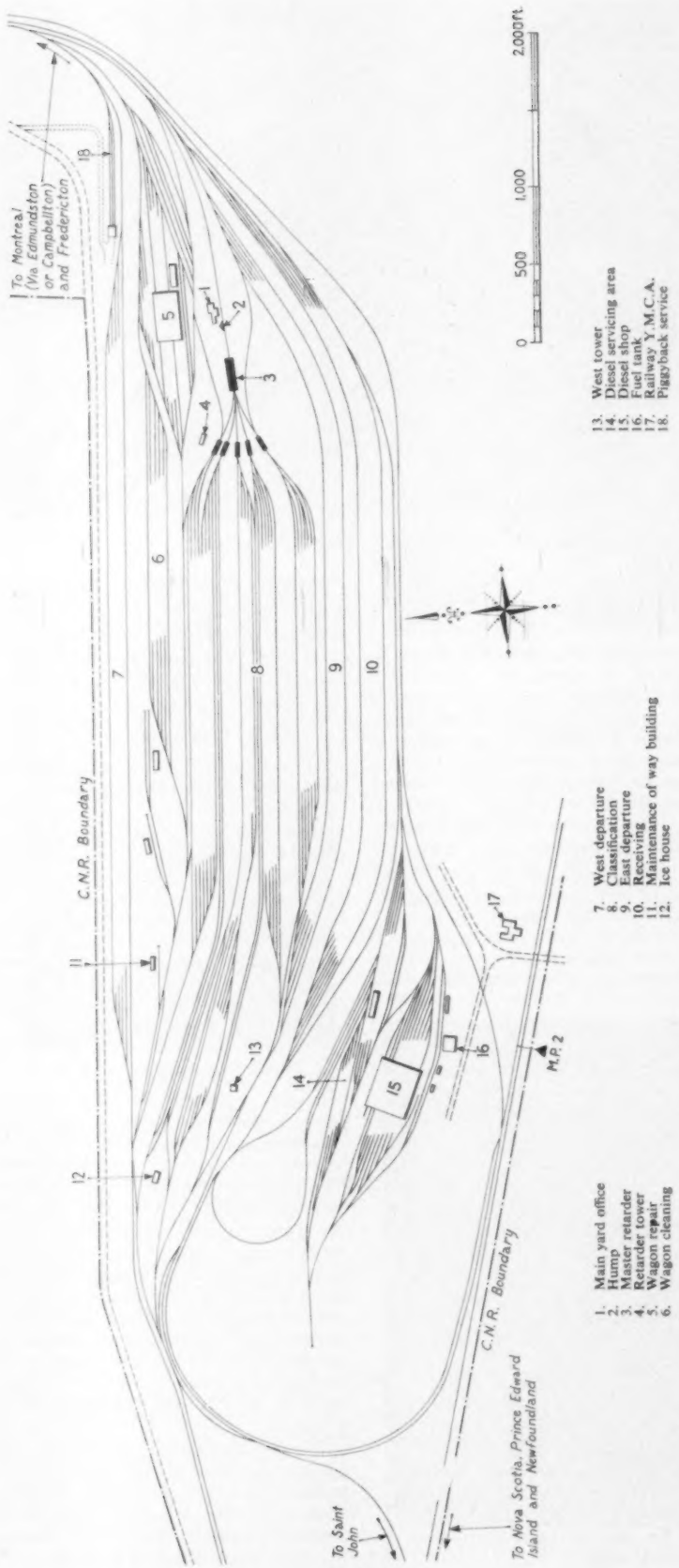
The one recently completed is about 2¼ miles long and over half a mile wide, and its 79 miles of track have a capacity of over 5,000 wagons. The 20 receiving and departure lines in three grids will accommodate about 2,100 wagons, and the hump-fed 40 classification roads nearly 2,200. In fact, the yard is capable of handling 3,500 wagons a day, a figure greatly in excess of the present traffic, but it is a rapidly-expanding one. With the wagon-capacity of each in brackets, there are six cleaning (250), 10 repair (160), seven local (330), and five piggyback (60) lines as well as quite separate diesel-locomotive and car-repair depots on the yard site.

Electronic computer system installed in temperature-controlled dust-proof room

It is not the size or capacity of this yard that is so outstanding but the equipment with which it is operated. This includes closed-circuit television, automatic wagon-weighing, an electronic brain for computing the extent of retarder-braking required from a wide variety of information fed into it, and two-way radio for direction of shunting operations. Also the lists of wagons for sorting are transmitted by " integrated data processing " from other stations and, with detailed instructions regarding every wagon, is received as punched cards. Moncton is linked with Truro (central Nova Scotia), St. John, Sydney (Cape Breton), Halifax and Edmunston (north-western New Brunswick), by I.D.P. This system of wagon description automatically provides information far and wide about each vehicle, which can thus be supplied to the consignor, or consignee, if he wishes it, at any station.

Checking of train

The arrival of a freight train at Moncton is thus preceded by details of its formation, the individual numbers of all its wagons, their destinations, contents, and any servicing that may be required. On arrival of the train a T.V. camera photographs each wagon, enabling the numbers of the wagons to be checked against the I.D.P. list, and also supplying details of any wagons added to the train at intermediate stations since it left the last station equipped with I.D.P. The



Layout of Moncton freight classification yard, Canadian National Railways

checked I.D.P. cards are passed through a " writing machine " producing copies of the sorting list for the hump conductor, the yardmaster and the retarder-controller, including details of servicing required.

The train is then pushed over the hump in the usual way, at the rate of 25 min. for a 100-wagon train. While on the move the wagons are weighed automatically. They are also manually oiled and pass over a dragging equipment detector, which throws signals to danger if there is anything dragging. The hump foreman directs the wagons singly or in groups into their appropriate classification sidings by button pressing according to the destination list. The uncoupling of the wagons is done by hand at the crest of the hump.

Electronic control

At this stage the electronic brain is fed with information as to the speed of each wagon as it rolls down from the hump supplied by a radar " speed-trap," and also as to its weight and rollability, the wind resistance on the hump, and the number of wagons already in the siding into which it is being directed. The brain is thus able to compute the braking force required first at a master retarder before reaching the grid points, and also at the group retarders beyond, as in the latest hump yards in Britain and other countries.

Subsequent wagon shunting is done by diesel locomotives whose drivers are directed entirely by two-way radio, and in which are coded cab-signals, repeating those at line side.

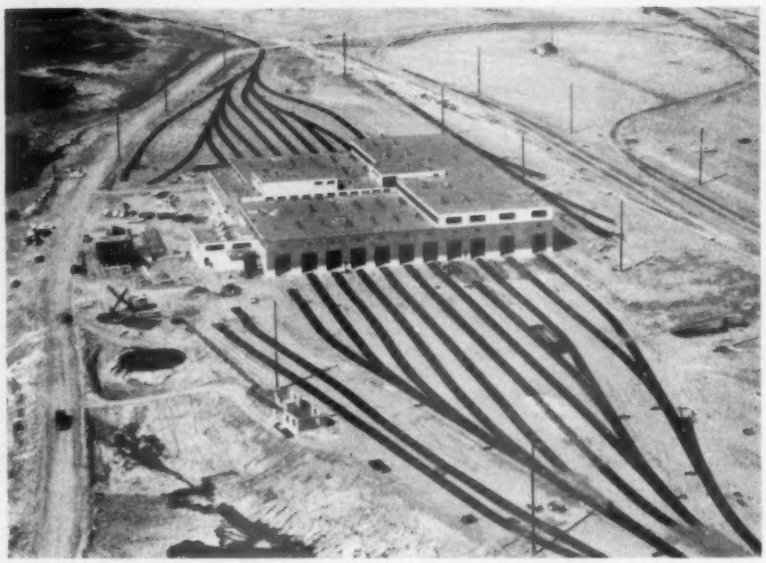
The longest classification roads are reserved for trains of export grain bound for shipment at Halifax or St. John, and also for coal trains from Cape Breton to Central Canada ; such trains pass out directly from these tracks for departure without going through the departure grids.

Radio and telephone communication

In the yard are three telephone exchanges with 150 lines connected to the various buildings and outside points. Five separate radio systems are used by the shunting locomotives, wagon inspectors and radio-equipped motor vehicles. Ten teleprinters working at 100 words a min. duplicate the sorting lists, and nine talk-back paging systems connect buildings and outside operators. Wagon routing-labels are written mechanically here for the first time in Canada, routing in Canada and the U.S.A. being divided into " blocks " and " zones." In Canada No. 1 block is Halifax and No. 99 Vancouver, on the Pacific. The mechanical label-writing is original and is done by an " inter-coupler " in the hump-conductor's office which transmits the information from the sorting lists by teletypes writing labels at the rate of

100 a min. This system was invented at Moncton.

What is claimed to be the most modern diesel shop on the continent is in Moncton yard. It is capable of carrying out all types of running repair, accommodates 32 engines at a time, and its construction cost over £700,000. It is unique in that it is a three-level building and is also divided lengthwise, the central section being used for utility purposes, permitting of increased accessibility from lead-in tracks at both ends. The utility centre houses oil- and water-testing laboratories, a classroom for trainees, machine shops, stores and offices.



Diesel locomotive repair depot, before completion

Diesel shop construction

The whole building measures 263 ft. by 340 ft. and is of the steel-frame type, this steel weighing over 1,000 tons. The east and west sides have brick curtain walls and the north and south sides insulated metal curtains. There are eight repair tracks at each end, and two other tracks run the length of the building and are fitted with wheel-drops. The repair tracks are all raised, as are also the two upper floors for facilitating cab- and roof-level work. One 10-ton and two 5-ton overhead cranes are provided along with all the ordinary wheel-turning, lubricating and other facilities. The whole shop is air-conditioned.

For outside servicing and inspection there are a 300,000-gal. fuel-storage tank, two 15-ton sanding towers and a building for storing 65,000 cu. ft. of wet sand. All these facilities are at the south-west side of the yard, whereas the wagon repair depot is at its east end.

In addition to a grid devoted to wagon cleaning, this depot has a repair shop containing the most modern servicing equipment. The wheel-changing system is the first of its kind in Canada. It consists of an electronic jack and a series of cranes enabling the shop crews to change all the wheels on a wagon in a matter of minutes. As in the locomotive depot, road-motor type service-station equipment is installed for the supply of oil, water and air with great rapidity. Under the floor heating ducts melt ice and snow off the undersides of cars in winter. To heat this shop with its nearly 62,000-sq. ft. area two steam generators send 14,000 lb. of steam an hour through over five miles of circulating pipes. Ten fixed and six revolving overhead heaters are governed by thermostatically-controlled switches. Wagons needing repairs are hauled by a trackmobile with both road and rail wheels. It can manoeuvre up to six wagons around the shop, when necessary raising itself off the track on to its road wheels, thus minimising delay.

Dual-purpose road and rail trackmobile used for shunting up to six wagons together in the wagon-servicing depot

Power supplies

With so much electric power required for various purposes throughout the yard, it is essential that there should be no current failures. Consequently it is supplied from widely-separated sources. The main 12,000-V. supply is reduced for such purposes as the floodlighting in transformers sunk in R.C. vaults to 600 V.

Near the diesel depot the C.N.R. administration has constructed a new Y.M.C.A. building, costing with equipment about £90,000 to provide rest accommodation for visiting crews.

Earthworks and permanent way

In the construction of Moncton yard some 3,000,000 cu. yd. of earth and similar materials were moved, and 300,000 tons of ballast and 274 turnouts were laid; there are 79 electric power point switches. Lighting is provided by 122 floodlight towers using 338 100-W mercury-vapour lamps. The water supply is from two drilled wells, and distributed through 19,000 ft. of piping to and from 100,000-gal. tankage. There are 10 miles of access roadways around the yard; these are not yet all surfaced and further work on them and on other auxiliary works is likely to take several more months to complete.

The construction has been under the general supervision of Mr. R. P. Puddester, Chief Engineer, Atlantic Region, C.N.R., Mr. M. J. Nickerson, Regional Engineer of Construction, and Mr. B. E. Field, Resident Engineer.

PERSONAL

British Railways

MR. J. G. URQUHART, Movement Assistant, Eastern Region, British Railways, who, as recorded in our February 17 issue, has been appointed District Traffic Superintendent, Perth, Scottish Region, joined the former London & North Eastern Railway as a junior clerk at Portobello, in 1941, and gained experience at stations in the Edinburgh district. He served in the Royal Air Force from 1944 to 1947. He was appointed relief Stationmaster in the Edinburgh district, in 1948, and, after three years' training as a traffic apprentice in the Eastern Region, became, in 1952, Assistant Yardmaster, Temple Mills. Mr. Urquhart moved to the Divisional Operating Superintendent's Office, Liverpool Street, in 1953 and, in 1955, was appointed Chief Trains Clerk & Chief

Mr. J. G. Urquhart

Controller, Stratford. In 1956, he moved to the Line Traffic Manager's Office, Fenchurch Street, where he was successively Chief Movement Clerk and Chief Controller, Passenger Assistant, and Movement Assistant —the position he now vacates.

MR. J. W. GALBRAITH, Acting District Operating Superintendent, Edinburgh, Scottish Region, British Railways, who, as recorded in our February 10 issue, has been confirmed in that position, joined the former North Eastern Railway at Tyne Dock in 1921, and served in the Sunderland and Newcastle Districts before being appointed Assistant Yardmaster, Blaydon, in 1944, and Deputy Chief Controller, Newcastle, in the same year. He took up a similar postion in Headquarters Control, Edinburgh, in 1947, and in 1949 to the Freight Trains Department of the Operating Superintendent's office, Scottish Region. In 1953, Mr. Galbraith became Assistant to the District Traffic Superintend-

Mr. J. W. Galbraith

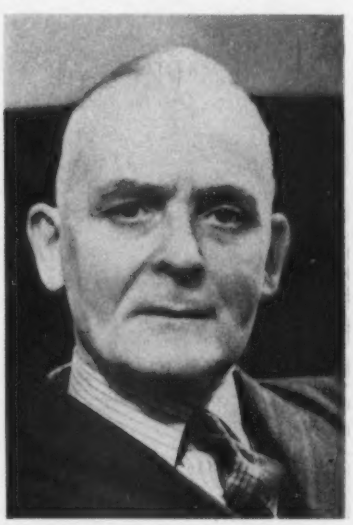
ent, Ayr. He was appointed Chief Freight Trains Clerk, Operating Superintendent's Office, Glasgow, in 1955, and, in 1956, became Assistant District Operating Superintendent, Edinburgh. He has been acting as District Operating Superintendent, Edinburgh, since April last year.

MR. H. ROWLEY, M.I.MECH.E., M.I.LOCO.E., Assistant Works Manager (Locomotive), Chief Mechanical & Electrical Engineer's Department, British Railways, Eastern Region, who, as recorded in our February 10 issue, has been appointed Assistant Locomotive & Rolling Stock Engineer, was educated at Doncaster Technical College and served an apprenticeship at Doncaster

Mr. H. Rowley

Locomotive Works and Motive Power Department. He held junior managerial posts in Doncaster Works, from 1936 to 1944, when he was transferred to the Locomotive Running Section and became Mechanical Foreman at Bradford, and later Annesley. Mr. Rowley returned to Doncaster Locomotive Works, in June, 1947, and became Assistant to Works Manager. He has held the position he now vacates since 1958. Mr. Rowley is a Justice of the Peace for the County Borough of Doncaster.

MR. S. C. H. FOSSETT, M.B.E., M.I.LOCO.E., Carriage & Wagon Works Manager, York, British Railways, North Eastern Region, who has retired, commenced his railway career as a premium apprentice at the Stratford Works of the G.E.R. in 1916. After a



Mr. S. C. H. Fossett

period in the locomotive drawing office he took charge of the train electric lighting department, in 1926, and was appointed Assistant Carriage & Wagon Works Manager, Stratford, in 1929. From 1931 to 1940 he was Outdoor Carriage & Wagon Assistant at Kings Cross and shortly after being transferred to York as Assistant Carriage & Wagon Works Manager, he returned to Stratford as Carriage & Wagon Works Manager. After a period of service as Superintendent of Dukinfield Factory, under the Ministry of Supply, Mr. Fossett was appointed Assistant Docks & Machinery Engineer, Hull, in February, 1946, and Principal Assistant Carriage & Wagon Works Manager, York, in October of that year. He was appointed Carriage & Wagon Works Manager, Stratford, in January, 1951. Mr. Fossett won a Whitworth Exhibition, in 1922, and was awarded the M.B.E., in 1953. He was President of the York Carriage & Wagon Works Ambulance Association and,

in recognition of his work for the first-aid movement, was admitted as a Serving Brother of the Order of St. John of Jerusalem. He was Chairman of the York Institute Players and a member of British Railways Staff Association Council.

MR. A. S. KIRBY, Assistant (Productivity & Work Study) to the Operating Officer, Euston, London Midland Region, British Railways, who, as recorded in our February 17 issue, retired on January 31, after 42 years of railway operating service, was educated at the Haberdashers' School. He graduated at London University and is an Associate Member of the Institute of Transport. In the early 1930's Mr. Kirby was engaged in Germany on a study of the operating and commercial methods of the German Railways. On his return to England he became successively Assistant District Controller at Rugby, Willesden, and Chester. In 1940, he was appointed District Controller at Chester. He became Assistant Chief of the Divisional Trains Office, Crewe, in 1942, Divisional Controller (Passenger Services),

Mr. A. S. Kirby

Crewe, in 1944 and Chief of the Divisional Trains Office, Crewe, in 1948. He was appointed Assistant (Productivity & Work Study) in 1955. Throughout his life Mr. Kirby has been a cornerstone of the Society of Friends (Quakers). Peace work and the improvement of international relations—especially among refugees—have occupied much of his private life. In his capacity as Chairman of European Refugee Committee of the Friends' Service Council he has regularly visited and inspected refugee camps throughout the Continent.

MR. C. H. SWAN, District Motive Power Superintendent, Hull, British Railways, North Eastern Region, has been appointed District Motive Power Superintendent, Wakefield.

MR. D. COOK, Assistant Director of Studies, British Transport Commission Staff College, Woking, has been appointed Public Relations Officer, Great Eastern Line, Liverpool Street, British Railways, Eastern Region.

MR. S. F. COX, Assistant Accountant, British Railways, Western Region, has been appointed Chief Accountant, Eastern Region.

MR. A. PATERSON, Acting District Engineer, Glasgow North, Chief Civil Engineer's Department, British Railways, Scottish Region, has been appointed Assistant Civil Engineer, Scottish Region.

We regret to record the death, last November, of MR. G. H. PEARSON who was, until his retirement in 1938, Assistant Mechanical Engineer & Works Manager, Ashford, Southern Railway. Mr. Pearson obtained his early experience on the Great Western Railway, entering the Locomotive Works at Swindon as a premium apprentice in 1892. While serving his apprenticeship he attended a two-year course in the Engineering Department of University College, London. After completing his apprenticeship, Mr. Pearson was engaged in the test house, drawing office and as Inspector of Materials at Swindon. He became Junior Assistant Manager in the Locomotive Works, and later, Chief Assistant Manager in the Carriage, Wagon & Timber Department at Swindon. In February, 1914, he was appointed Manager of the Locomotive, Carriage & Wagon Works of the South Eastern & Chatham Railway at Ashford and on the formation of the Southern Railway was appointed Assistant Mechanical Engineer. He was responsible for the design of the functionless drawbar spring for the Great Western dynamometer car.

Overseas

MR. N. R. CRUMP, President, Director & Member of the Executive Committee, Canadian Pacific Railway, has been elected Chairman & President.

MR. I. D. SINCLAIR has been appointed a Director and Member of the Executive Committee of Canadian Pacific Railway and has been elected a Vice-President.

MR. J. M. ROBERTS, General Traffic Manager, Canadian Pacific Railway, has been appointed Vice-President (Traffic).

MR. R. AYRE, Supervisor Films & Television, Canadian National Railways, has been appointed Supervisor of Visual Redesign.

MR. H. I. SIM, Freight Traffic Representative, North of England, Canadian National Railways, who has been appointed District Express Agent, Liverpool, commenced his service with the C.N.R. in Liverpool, in 1935. After employment in the Express Department for a number of years, with a break for war service, he was transferred to the Freight Department, as Chief Clerk, in 1951. He was appointed to the position he now vacates, in 1953, and is succeeded by MR. G. M. BARR.

MR. L. S. McGREGOR, General Superintendent of Motive Power & Car Equipment (Central Region), Canadian National Railways, who, as recorded in our February 10 issue, has been appointed Chief of Motive Power & Car Equipment, joined the C.N.R. in the Motive Power Department in 1926,

Mr. L. S. McGregor

as an office boy. He later attended McGill University, Montreal, at the same time completing his apprenticeship in the C.N.R. shops in the summer months, and graduated in 1936 with a degree in mechanical engineering. After a break for war service, Mr. McGregor was successively Assistant Engineer in Montreal, Superintendent of Motive Power & Car Equipment for the Northern Ontario District, and General Superintendent of Motive Power & Car Equipment for the Central Region at Toronto.

MR. J. HUDSON, Chief Mechanical Engineer, East African Railways & Harbours, has retired. MR. W. E. BULMAN, Assistant Chief Mechanical Engineer (Technical) has been appointed Acting Chief Mechanical Engineer.

The Nigerian Railway Corporation has announced the following appointments: MR. H. M. ALEXANDER, Deputy Chief Engineer, (New Works), has become Chief Engineer; MR. F. A. O. PHILLIPS, Locomotive Works Superintendent, has become Chief Mechanical Engineer; MR. S. EPELLE, Publicity Officer, has become Public Relations Officer; MR. F. H. JAECKEL, Deputy Chief Superintendent (Traffic), has become Chief Superintendent; MR. J. C. EGBUNA, Assistant General Manager (Works), has become Deputy General Manager (Supernumerary).

We regret to record the death of MR. A. J. GARRATT, former Electrical Engineer of the Buenos Aires Great Southern and Buenos Aires Western Railways. Mr. Garratt was 81.

Ministry of Transport

The Minister of Transport has selected MR. JOHN ELSE for appointment as Chairman of Traffic Commissioners & Licensing Authority for the West Midland Traffic Area in place of MR. W. P. JAMES, who is retiring from this post to join the Air Transport Licensing Board. The effective dates of Mr. James's retirement and Mr. Else's appointment will be decided shortly.

NEW EQUIPMENT *and Processes*

CONTINUITY CONNECTOR

A simple and efficient device (illustrated above) is now available for temporary connection of armour wires or tapes, metallic sheathing, or concentric neutral wires of electric cables while jointing on a live network. It also is claimed to be suitable for bridging gaps in pipes, structural metalwork, machinery, and other cases where it is necessary to maintain electrical continuity during a period of mechanical separation.

The connector comprises two nickel-plated bodies joined by heavy tinned copper braid housed in thick transparent plastic sleeving. After passing the free end round the cable, the braid is hooked in a hinged claw fitting, pulled tight, and secured by the screw shown at the far side of the body. Intimate contact then is established by tightening the other screw.

Further information relating to this product can be obtained from the manufacturer, the Hepworth Iron Co. Ltd., 116, Canbury Park Road, Kingston-on-Thames, Surrey.

CO-ORDINATE VICE

A co-ordinate vice of American design is being produced for the European market by Aktiebolaget Malcus Holmquist of Sweden. The vice has innumerable uses, is easy to fit, and adjustment is very fast and accurate in any position. A light turn of the operating lever is sufficient to clamp or release the job. Size of jaw is 1¾ in. x 5 in., and maximum gap is 9 in. The vice is being distributed in the United Kingdom by George Cohen, Sons & Co. Ltd., Engineers' Tools Department, 25-29 Bulwer Street, Shepherds Bush, W.12.

HOPPER WAGON

Currently undergoing exhaustive functional tests is the tank-hopper wagon illustrated below, orders for which have been placed by Canadian National Railways and the Roberval & Saguenay Railway.

Illustrations show (left): the exterior of the wagon and (right): a cut-away view from above, in which the curved sides (which eliminate the need for side-parts), crossbearers, and part of the centre sill between the bolsters can be seen. Eight discharge gates along the centre of the car provide a smooth interior facilitating unloading and cleaning.

The new vehicle was developed jointly by the Aluminium Co. of Canada Ltd., and the C.N.R., and has a capacity of 80 tons—ten tons more than existing steel C.N.R. rolling-stock. Designed on a five-foot module, it can be built with a capacity of 2,500, 3,000, or 3,500 cu. ft. without substantial re-design or change in production jigs.

Trials have involved static overload tests and impact tests—at speeds up to 10 m.p.h.—which have imposed loads approaching 450 tons. Made at sixty locations, strain recordings give no evidence of failure of the structure.

The proving programme will include high-speed road tests over a distance of several hundred miles and fatigue tests on a pulsating jack.

Prototype wagons will be used unpainted. They are stated to be suitable, with only a few exceptions, for all products now handled in covered hopper wagons, and also some special ladings which require protective linings when carried in conventional stock.

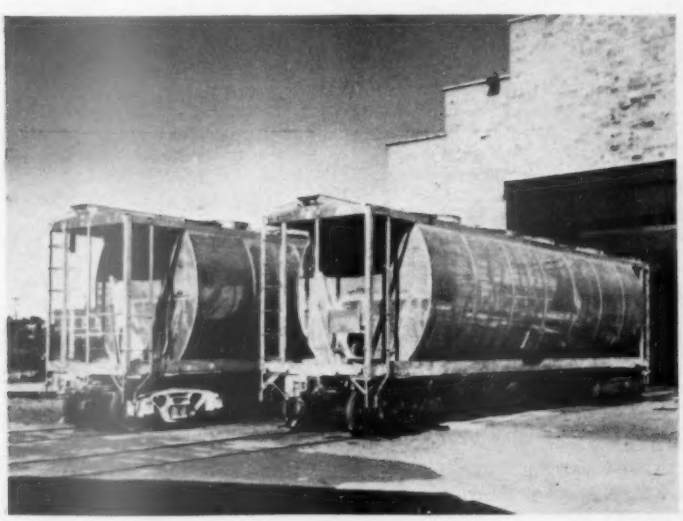
Further details can be obtained from Alcan (U.K.) Limited, 30, Berkeley Square, London, W.1.

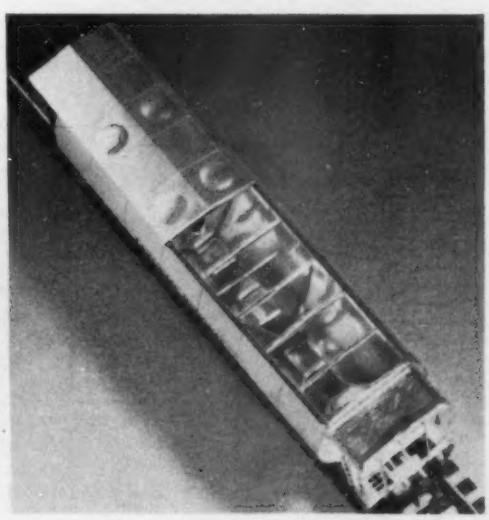
PROFILING BY TAPE CONTROL

Milling production times can be substantially reduced by using automatic computer-controlled techniques. Intricate profiles which formerly would have been expensive and lengthy to copy from templates can be machined in one-tenth of the time with the aid of a Cincinnati milling machine fitted with Ferranti controls. Typical of milling operations possible with these techniques is one where waveguide blocks are machined in light alloy to within tolerances of less than one-thousandth of an inch.

The machine also can be used for cam profiling and for stack-milling W.D.S. tooling aids.

Further details can be obtained from the British Oxygen Co. Limited, Bridgewater House, St. James's, London, S.W1..





Ministry of Transport Accident Report

Waterloo Station, June 3, 1960, British Railways, Southern Region

Colonel D. McMullen, Inspecting Officer of Railways, Ministry of Transport, inquired into the collision which occurred at 6.32 p.m. on June 3, 1960, at Waterloo between a steam-hauled passenger train and an electric empty coaching stock train. The steam train left No. 12 platform at 6.31, and after travelling 280 yd. came into facing sidelong collision with the up electric train of empties, which was destined for No. 6 platform. The up electric train crossed the steam train's route and was, therefore, to have been stopped at the inner home signal. Instead it passed that signal at danger, and the two trains collided 92 yd. beyond that signal.

Neither was derailed or seriously damaged, and the steam train continued to Vauxhall, where passengers detrained. Apart from a few cases of slight cuts or shock, there were no injuries. The electric train was removed, and the lines affected were re-opened to traffic at 8.15 p.m. after they had been examined and tests had been carried out. Subsequently these and other lines were closed for various periods to enable further tests to be made on the signalling equipment. Very considerable delays were caused to the train service generally.

The steam train was the 6.14 p.m. from Waterloo to Weymouth. It was hauled by a "Merchant Navy" class 4-6-2 engine, driven from the left-hand side. The 6.12 p.m. electric train from Durnsford Road to Waterloo consisted of two main-line corridor coaches. The motorman's position was on the left-hand side of the cab.

The relevant part of the Waterloo Station layout and signals is shown in the diagram. There are eight tracks from Waterloo to Vauxhall, one mile away, but the three directly concerned are the up main relief (U.M.R.), up main through (U.M.T.) and down main through (D.M.T.). The lines curve considerably. Approaching the terminus the up lines enter a long left-hand curve, the latter part of which is of 14 ch. radius, followed immediately by a 7-ch. right-hand curve into the station.

Signal layout

All lines are fully track-circuited and the signals are three- or four-aspect multiple lens colour-lights. They and the electrically operated points are controlled from an electrically interlocked frame with 309 miniature levers, 272 of which are working levers. The frame is arranged round three sides of a rectangle, and above it are four illuminated diagrams. All aspects of signals are repeated above the levers, except that, when a signal (*i.e.*, one with a route indicator for several routes) is controlled by more than one lever, the repeaters are only above the end levers.

A further indication F shows when illuminated that the route is correctly set, locked, and detected, so that the lever is free to be pulled. N and R indicator lights above each point lever show the position of the points and also that the detection circuit is made.

Running signals leading to more than one route are, with one exception, equipped with theatre-type route indicators. The exception is Signal 77-83 outside Vauxhall governing the divergence of the U.M.R. from the U.M.T. line. For the former a junction indicator is used. In all cases there is a separate lever in the frame for each route.

There are no block instruments between Waterloo and Locomotive Junction Signal-box, two miles away. Train describers are used in both directions.

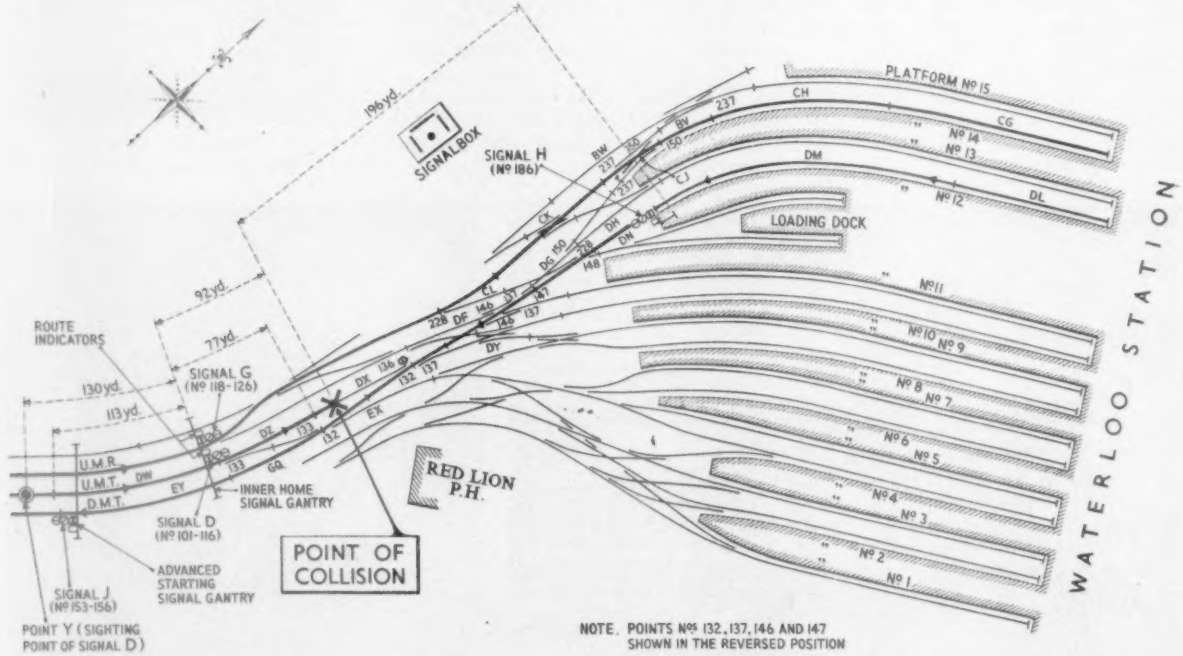
Three trains were concerned, on the U.M.R., U.M.T. and D.M.T. lines respectively. The signals involved were as follows:

Up Main Relief: No. 83 (junction indicator) at Vauxhall; No. 86, 696 yd. ahead of 83; Nos. 88-90 (route indicator) outer home 417 yd. ahead of 83; Nos. 118-126 (route indicator, G on diagram) inner home 490 yd. ahead of 88-90.

Up Main Through: No. 77 (no junction indicator) at Vauxhall; No. 78, 696 yd. ahead of 77; Nos. 79-81 (route indicator) outer home 417 yd. ahead of 78; Nos. 101-116 (route indicator, D on diagram) inner home 490 yd. ahead of 79-81, and 92 yd. short of point of collision.

Down Main Through: No. 186, led by No. 184 (H on diagram), No. 12 platform starter to D.M.T. line (it is 196 yd. in rear of the point of collision); Nos. 153-156 (J on diagram) D.M.T. advance starter.

Most of the signals are on gantries spanning the lines. Every signal is immediately



Circumstances of accident at Waterloo Station, British Railways, Southern Region (only part of Waterloo Station is shown).

to the left of the line to which it refers, and the route indicator is on the left of the signal.

Signals hard to see

Because of the curvature, the sighting of some of the signals, particularly the inner homes, is restricted and difficult. From the cab of an electric train on the U.M.T. line signal 79-81 can be seen at 172 yd. Provided that there is no train on the U.M.R. line, signal D can be seen at 130 yd. The position of the advanced starter signal gantry results in Signal G on the U.M.R. line coming into view about 5 yd. before signal D on the U.M.T. line. The guard of a train on the U.M.T. line can first see, through the periscope, Signal G at a distance of about 125 yd., and then Signal D at 110 yd.

Signalling controls

As with mechanical interlocking, the electrical interlocking prevents the levers of signals controlling conflicting routes from being reversed at the same time. The track-circuits exercise the usual controls on the signals and points. A signal is held at red by the occupation of any track-circuit in the route which it controls up to and including the overlap track beyond the next signal ahead. There is an exception to this in the case of the inner home signals. Each platform line is divided into two track-circuits; when both are unoccupied, the inner home signal will clear to green, but it will clear to yellow if the inner track-circuit is occupied but the outer track-circuit clear.

When a route is set up and its signal cleared, and when the approach-locking track-circuit is occupied by the train, the signal lever is back-locked until the train has reached a certain track-circuit ahead of the signal. The lever then can be replaced to normal, but the route remains locked up to and including the overlap track-circuit ahead of the next signal; or, in the case of an inner home signal, up to the platform line. The occupation of a track-circuit also directly locks all facing and trailing points which lie on it in either the normal or reverse positions, according to the way in which they are set.

There are no releases for the track-circuit locks. A lineman must be called and must unlock the back of the frame and remove a panel. He can then free a track-circuit lock on a lever simply by lifting the lock. To release the lever interlocking, he must first break a seal. This is a very infrequent occurrence and needs to be done only during alterations in the interlocking or in the event of a fracture of a lock. All releases given by linemen must be noted in a special register and signed by both the lineman concerned and the person at the time in charge of the box.

Signal detection

Electric detection, set to the limit of $\frac{1}{16}$ in., is provided on all facing and trailing points on running lines. With facing points it ensures that they are properly locked before the signal of the lever concerned can be released. If the detection of any points is disturbed by vibration or by men working on the track nearby, the signal will change to red. When this occurs, or when a " bobbing " track-circuit in the controlled route replaces a signal to red, the signal will stay at red until the controls are correct and the signal lever has been replaced and re-pulled.

Signalling circuits are 110 V. a.c. The current supply for the signals is also 110 V. a.c. up to the signal cabinets, where it is transformed to 12 V. a.c.; 50 V. d.c. is used for the route indicators and 130 V. d.c. for the point machines. The track-circuits are of the single rail a.c. type. Because of the low speed of trains approaching and leaving the terminus, the overlaps beyond signals are short; that beyond signal D is 77 yd. long. Overlaps are designed as protection from misjudgment in braking, and not from the disregard of signal aspects.

Course of events

At 6.30 p.m. the " train ready to start " indication was received in the signalbox from No. 12 platform, for the 6.14 p.m. down Weymouth train. The route was set up for it to proceed to the D.M.T. line, and signals H and J were cleared. At that time descriptions for the 6.12 up electric train (of empty stock) and a steam train, the 3 p.m. up Bournemouth to Waterloo, already had been received from Locomotive Junction box. The electric train passed Vauxhall at 6.28 p.m. and proceeded along the U.M.T. line. The steam train passed Vauxhall at 6.31 p.m., and was diverted to the U.M.R. line, because it was to run into No. 14 platform and its route was parallel to that of the 6.14 p.m. down train and both routes could be set up simultaneously.

The electric train was destined for No. 6 platform. This meant that its route crossed that of the down train, and so it was to be stopped at signal D. The signal equipment allowed it to be brought up to this signal with the crossing movement for the down train set up, but the electric locking and controls prevented this signal from being cleared. As mentioned, the up electric train passed Signal D at danger.

The up steam train was some way behind the up electric train. Its driver saw signal G showing green with a route indication 14, and he proceeded into his platform. Neither he nor his fireman were aware of the collision between the other two trains until later.

The driver and fireman of the down train both saw Signal H at clear. They were unaware of the collision until later, but the guard, who was travelling in the ninth coach, felt the impact. As he saw that the train, though damaged, was not derailed, he felt it safe to allow it to proceed to Vauxhall, where the passengers could detrain more easily. He stopped it there by applying the brake valve in his van.

Evidence

The signalmen on duty confirmed that the repeaters for Signals G, H, and J showed green when they were cleared for their respective trains. They had agreed between themselves that the up electric train should be held. Therefore Signal 79-81 was held at red for some time, and they thought it probable that the up electric train had stopped there before it was cleared to allow it up to Signal D. They saw that the latter signal's repeater light was red.

The Yard Inspector in charge of the box said that he had given instructions for the 6.14 p.m. down train to be despatched. This meant that the up electric train would be stopped. He confirmed the signalmen's evidence as to the repeaters. He saw the collision, and at once saw that the repeater for Signal D was red, and that the point levers were in the correct position for the down train's route. The lever of Signal D was normal. He and the signalmen were definite that there was no lineman in the box at the time. Nor had a back-lock release been given, as their shift began at 1 p.m.

Motorman's statement

The motorman who drove the 6.12 p.m. up empty electric train said that he followed a Guildford train the whole way to Waterloo. Every signal was yellow for his train until he saw Signal D, which was green. When he came in sight of it, he saw the platform indicator showing " 4 " and when he came further round the bend he also saw a " 1 ," which was Platform 14. He had braked a little at the previous signal, expecting to be stopped at Signal D, but when he saw that signal at green, he released his brakes. He said he also saw the tail of the train in front still going into the station. He thought it strange that the signal had come off so quickly, and felt uneasy. He kept his eye on his signal (D) even to the extent of bending down to see it go over the top of his head. He looked down on to the track, and was astounded to see the steam train was across his path. He immediately braked and was on the verge of stopping when the collision occurred.

He was most emphatic about the aspects of his own signals. He had not noticed the signals on the U.M.R. line, but agreed that if he had not felt uneasy, he would have seen both Signals G and D. But he had his eyes on his own signal. He had never had any doubts as to whether he was on the U.M.T. or U.M.R. line. He was certain that he had not seen Signal G at green (which it was) with a route indication, 14 (which it had) and mistaken it for signal D.

He was questioned closely about his statement that he saw the train ahead of him going into a platform. This he said was a second or two after he had seen Signal D at green. He stated that the train had gone into No. 4, 5 or 6 platform, and that when he saw it, about three coaches had not reached the platform. He agreed that on many occasions, after the three preceding signals had showed yellow, Signal D showed green when it came into view.

Lack of confidence in signals

A year or two ago he had experienced a wrong indication when running into Waterloo on the up Windsor line. The route indicator had shown 21, but the train was taken into Platform 20. He said that he had not much confidence in the signalling equipment at Waterloo, and that other motormen also thought that there was something wrong. He quoted two previous cases of motormen being accused of passing signals at danger when they were certain that they had not done so. One case was the starting signal for the No. 21 platform.

The guard said that he was observing signals through the periscope, and that Signal D was green when it came into view. Having once seen it, he did not keep it in view. He did not observe the U.M.R. signals.

Colonel McMullen states that in view of the motorman's positive statement that Signal D was at green with a route indication

to No. 14 platform, and of the doubts cast by him and, according to him, by other motormen on the integrity of the signalling at Waterloo, it was decided to adjourn the inquiry to enable tests to be made.

The tests were designed to see if, in any circumstances, a signal could give a false clear aspect or if signals for conflicting movements could be cleared at the same time. They embraced routes from Signals D and G to No. 14 platform, Signal H to the D.M.T. line and, in view of the motorman's allegation, the starter from No. 21 platform.

The electric lever interlocking provides that before signal D on the U.M.T. line can be reversed, Points 132 must be normal. Before Signal H can be reversed to give access to the D.M.T. line, Points 132 must be reversed. Once Signal H has been cleared, Signal D is locked and cannot be cleared.

In the down direction, once signal H has been cleared, the track-circuit locks already described prevent Points 132 from being moved from the reversed position until the train has not only cleared No. 14 platform track-circuits, but has passed beyond track-circuit EX. In the up direction the approach-locking takes effect when track-circuit DW, which begins 113 yd. on the approach side of Signal D is occupied, and from then onwards the route into the platform is held. Points 132 have to be normal for this movement, and the controls prevent them from being reversed until the train has passed beyond track-circuit DX.

Signal equipment in good order

The tests of all the above circuits, and other tests as well, were duly carried out, with the result that Colonel McMullen was satisfied beyond all doubt that the equipment was in thorough working order.

When the inquiry was re-opened, he made a public statement. The electrical interlocking equipment, he states, was proved to be in excellent order, and the relay room well laid out, clean, and well maintained. The tests showed that, unless there were deliberate interference with the equipment, Signals 101-116 (*i.e.* signal D) on the U.M.T. line could not have shown a green aspect with a route indication for platform 14 when a route was set for a train on the U.M.R. line to enter that platform, or for a train to leave No. 12 platform. The tests also confirmed the integrity of the starter for No. 21 platform.

False indications in these cases could have been given only by the cross-connection of certain terminals on the equipment or by faulty insulation admitting extraneous currents into the relevant circuits. Several such connections would have had to be made simultaneously. It was impossible that they could have been made by the accidental contact of a testing-lamp, which anyhow is covered with non-conducting material.

These wrongful connections could be made only deliberately by a lineman with expert knowledge, which is unthinkable. There was no lineman in the relay room or operating room at the time, nor was the back of the frame open.

It is beyond the bounds of possibility that extraneous currents could have found their way simultaneously into all the circuits concerned. Nevertheless tests were made with a voltmeter, and resistance tests were also applied. These yielded negative results. In addition the entire cable run to Signal 101-116 (Signal D) was uncovered, and the signal and route indicator were examined. No defects were found.

All signal circuits are so designed that any failure is on the side of safety. If necessary, a signal will change from green to red, but never from red to green.

The equipment tested was in good condition and no doubt the rest also is. Colonel McMullen's conclusion is that Signal D would not have shown a green aspect with a " 14 " route indication at the time when the routes were set for the other two trains. That last two routes were so set is a fact, and not a question of speculation. The statement also exonerates the No. 21 platform starter.

Inquiry resumed

Both the motorman and the guard of the up electric empty train were present when the public statement was made. On re-examination, it was suggested to the motorman that he had mistaken Signal G, with its green aspect and " 14 " indication, for Signal D. He adhered to his belief that Signal D was showing these indications.

As regards the glimpse which he said he caught of the train ahead drawing into No. 4, 5 or 6 platform, the following facts were pointed out to him on a scale plan:—

When Signal 79-81 came into his view at a point 172 yd. behind it and was seen by him to be at yellow, that meant that the train ahead of him must have cleared the overlap track-circuit DZ, which extends to 77 yd. beyond Signal D. After Signal 79-81 had been sighted, his train had to travel 530 yd. to the point where Signal D comes into view. The motorman was shown on the plan that from this last point the right-hand curve into Nos. 1-10 platforms and the Red Lion public house near the track made it impossible to see these platforms or any train going into them. While the motorman's train was travelling the 530 yd. from the one sighting-point to the other, the train ahead had to travel only 110 yd. before it became obscured from view. Nevertheless, the motorman insisted that he had still seen the train ahead, and that was why he was uneasy when he saw Signal D at green.

The guard of the train was prepared to admit that he might have misread Signal G for Signal D, but he was almost certain that he had not done so. He reiterated that having once seen a green aspect which he was confident was on his signal, he turned his eyes away.

Inspecting officer's conclusions

Colonel McMullen reports that he was entirely satisfied that Signal D was at red when the up electric empty train passed it. From the tests described above it could not have been clear when it first came into view. Despite his insistence to the contrary, the motorman must have seen Signal G, which showed green and an indication " 14 " for the up Bournemouth train on the U.M.R. line, and have assumed mistakenly that it was for his train. These were the precise indications which the motorman said that he saw on Signal D. It is difficult to suggest any reason for his failure. The most likely one seems to be that he thought momentarily that his train was on the U.M.R. line, although he was certain that he had not done so.

It was obvious from his evidence that he still did not believe that Signal D was red when he passed it. Colonel McMullen thinks that the more he considered the matter, the more he became sure that he was right. This may explain his impression about the train that he had said he had seen ahead of him.

The guard could have prevented the accident if he had been keeping a proper look-out as required by the rules. The observance of signals through a periscope is not easy on account of the curvature.

Colonel McMullen recommends that consideration be given to improving the sighting of these particular signals and any others where the curvature of the line causes difficulties, either by moving the signals slightly on the gantries or by altering their angle of focus, or even if necessary by altering to a small extent the position or height of a gantry.

The use of lenses with a wide beam spread might also be considered.

In modern installations the approach-locking track-circuits extend far enough back to ensure that once a driver has seen a signal at clear, the route ahead is held. This is not the case on the up lines at Waterloo. Even although Colonel McMullen is certain that Signal D was red when it first came into view from the electric train, he considers it advisable for the approach-locking track-circuits at Waterloo to be so extended.

He is completely satisfied as to the integrity of the signalling tested, and sees no reason for apprehension as to the rest.

Unusual load by rail to Blaenau Ffestiniog

On February 19, a giant transformer weighing 123 tons was railed from Colwyn Bay *via* Llandudno Junction up the single-track branch line to Blaenau Ffestiniog for the Central Electricity Generating Board.

Nearly 13½ ft. high and 10½ ft. wide, the transformer is 1 ft. wider than a normal load and was carried on a specially-designed 24-wheel transformer wagon equipped with traversing gear which allows the load to be moved sideways on the wagon to clear lineside obstructions.

The special train included extra vehicles to space out the heaviest sections—the transformer and the locomotive—and was hauled by a 1,000-h.p. diesel locomotive connected by a special telephone system with the transformer wagon.

Test trips

The whole route, which passed through a winding two-mile tunnel offering in some places clearances of only ½ in., had been surveyed in advance and detailed instructions were prepared. Test trips with a wooden profile of the transformer were carried out over the most difficult sections to make sure that clearances were possible and to enable exact plans to be drawn up.

On the journey from Colwyn Bay to Blaenau Ffestiniog the load had to be moved to the left or the right on the traversing wagon no less than 20 times. One of these occasions was in the tunnel itself.

Automatic marshalling yards

A paper entitled " Automatic marshalling yards " was read at the January meeting of the Institution of Railway Signal Engineers by Mr. J. C. Kubale, General Manager & Director, A.E.I.-G.R.S. Limited. The paper, which was summarised in our January 27 issue, was augmented by demonstration equipment and a sound film " Railmaking with Radar."

The discussion was opened by Mr. D. G. Shipp, Assistant Divisional Manager, Signal & Colliery Division, Westinghouse Brake & Signal Co. Ltd., who said that in his experience of marshalling yard operation he had also observed the wagon defects mentioned in the paper. The more common of these had been the tightening of the brakes when wagons pass round curves. Examination has shown that this has been caused by undue slackness between the axleboxes and the guides on which they run, and this has caused the axle to be pushed back as the outer wheel encounters the curve, forcing it into the rear brake block. The second defect concerned brake adjustment on new wagons or those which had recently passed through the repair shop. Many cases have been found where the adjustment is too fine, so that they do not release the wheels. Instances have been observed where wagons had actually stopped on the run down from the hump. Despite these defects automatic equipment was giving very good service which would be enhanced if wagon performance could be improved.

Reason for multiple retarders

Mr. E. A. Rogers, Assistant Signal Engineer, Chief Signal & Telecommunications Office, British Transport Commission, questioned one section of the paper in which Mr. Kubale stated " the principal reason for having multiple retarders is an economic one, as for every foot of retarder which is useful in the primary an equal amount is saved from each secondary retarder to which it leads." Reading the statement as it appears, the economic answer is to have no secondary retarders. Because there are four secondaries to each primary, it would seem cheaper to put all the braking into the primary. Mr. Rogers asked if the true purpose of both primary and secondary retarders could be clarified. He was disappointed that no figures had been given in the paper to assist financial justification or to prove increased operating efficiency. Mr. Rogers also enquired whether Mr. Kubale had considered any of the alternative techniques for controlling wagons in hump yards particularly the use of continuous control.

Mr. Kubale said the number of retarders had to be balanced against the overall distance from the crest of the hump to the clearance point. The longer that distance is, the greater is the total length of retarder necessary for the route. It was also advantageous to place the retarders as close to the groups of sidings as possible. If primary and secondary retarders were combined and assuming they were each 60 ft. long, all secondary retarders would then be 120 ft. long. This would be more expensive and inefficient. After explaining the point further, Mr. Kubale said that it was difficult to obtain statistics on the improvements effected by automatic operation. Tests had been made by observers extending over several days and even with these meagre figures it was evident that automatic operation had provided very considerable improvement in yards hitherto manually worked. Mr. Kubale affirmed that alternative systems available had been examined.

Mr. T. Baldwin, Assistant Director, Research Department, Derby, British Transport Commission, regretted that more information about wagon characteristics had not been given and gave examples of wagons with varying resistances. He agreed with the previous speaker regarding the possibilities of continuous control.

Mr. Kubale, in reply, mentioned some of the many differences there were in the way wagons ran and the difficulties in making the various observations. For example, a wagon might be freely running when its rollability is measured, but after it had passed through a retarder the brake becomes applied and the calculations are thrown out. Statements are often made that if wagons do not reach their target an error has occurred; this may be so, but it is on the safe side. Some consider that with an automatic yard there should be no further anxiety at all, and that no maintenance is necessary. Mr. Kubale considered that this condition had not yet arrived and might not even in the near future. But with experience gradual improvement must accrue and the results at the present time were much superior to manual operation, particularly having regard to the type of personnel available for this work. Mr. Kubale agreed with Mr. Baldwin regarding the desirability of having available statistics on velocity, impact and other matters but emphasised the difficulty in organising these observations and the number of staff that would be necessary. Some tests had been made but he thought that these results were too scanty for publication in the paper and preferred to wait until further figures were available.

Mr. M. E. Leach, Assistant Signal Engineer, Western Region, British Railways, Mr. B. H. Grose, Assistant (Development) to Chief Signal & Telecommunications Engineer, B.T.C., and Mr. J. Davies, Senior Technical Assistant, Research Department, Derby, B.T.C., also contributed to the discussion.

Mechanical handling of freight

Close co-operation between British Railways and one of its large customers in the Sheffield area is resulting in the introduction of a large-scale and most modern system of mechanical handling of freight traffic. A new fleet of 250 specially-designed pallet vans, Palvans as they are called, is being built by British Railways to deal with Izal products despatched from the factory at Chapeltown, near Sheffield, of the Chemicals Division of Newton Chambers & Co. Ltd.

In addition to the special arrangements for efficiency and speedy loading and unloading the Palvans have roller bearings, hydraulic buffers and vacuum brakes, all features which increase safety in speedy movement. Their outstanding feature is their permanently fitted system of air dunnage, a method of cushioning the packed goods during carriage to prevent movement which might cause damage as well as hinder unloading.

Complete palletisation of all products is being carried out at the Izal factory in Chapeltown and from the inception of that scheme at the beginning of last year representatives of British Railways and of Newton Chambers have worked closely together in the organisation and provision of modern transport methods.

Palletisation

As an integral part of the mechanisation of the factory's transport system the company built a loading bay, fully enclosed and protected from the weather. It has also introduced the use of a special type of loading pallet designed to suit the factory's internal mechanisation and also the use of fork trucks to serve the railways' Palvans in the loading bay. Each Palvan is partitioned into four compartments and each compartment takes two pallet loads. There are eight sliding doors to enable loading and unloading to take place freely and with no obstructions from both sides of the vehicle to and from each separate compartment.

Compressed air, available from supply lines installed in the covered loading bay, is used to inflate plastic containers fitted into the compartments. The inflation may be varied to suit each load and each compartment, to provide complete cushioning in every case and to prevent any movement of the packed products during transit. The Palvans are being made at British Railways carriage & wagon works at Derby, and are being painted in the company's own special green colour.

In operating this new system of freight carriage, Newton Chambers will use an organisation of railhead distribution stores at British Railways depots throughout the country where it will be able to maintain stocks of its products for distribution to customers within areas local to each railhead.

European Railways information & publicity

The Information Centre of the European Railways (C.I.C.E.), established by the International Union of Railways (U.I.C.) in 1950, has been replaced by the Information & Publicity Centre of the European Railways (C.I.P.C.E.) which has two separate sections: Public Relations and Publicity. An inaugural meeting was held by the control committees of the two sections in February at the headquarters of the U.I.C. in Paris. The chairman was Signor Branca, Deputy General Manager of the Italian State Railways, Chairman of the control committee of the Publicity Section of C.I.P.C.E., supported by Dr. M. Strauss, Secretary-General of the Swiss Federal Railways, and Chairman of the control committee of the C.I.P.C.E. Public Relations Section.

Delegates were present of railway administrations in Austria, Belgium, Denmark, France, Western Germany, Holland, Italy, Portugal, Sweden, and the United Kingdom. The British delegates were Mr. M. B. Thomas, Public Relations & Publicity Officer, Eastern Region, British Railways, and Mr. G. M. Leach, International Traffic Officer, B.T.C. Also present were Monsieur Louis Armand, Secretary General, and Monsieur P. A. Rousseau, Chief Executive Officer, U.I.C. Signor Branca stressed the principal duty of the Publicity Section, to stimulate the

demand for passenger and goods services provided by the railways.

Dr. Strauss pointed out that the Public Relations Section had a threefold aim: to publicise more widely the activities of U.I.C. bodies; to win public understanding of and confidence in the European railways in general; and to afford the members of his committee greater knowledge through exchange of experience acquired by the various railway administrations.

Monsieur Armand emphasised the part which should be played by public relations and pointed out that the railways which, generally speaking, had restricted funds available for publicity, could through their public relations win the confidence of the public and also of political and financial circles.

The special-purpose vehicle

The value of the special-purpose vehicle was highlighted by a film shown on February 15 by Unilever Limited. The film, which is suitable for industrial audiences, works study courses, and technical colleges, is entitled "Handling loose materials," and was made for the Unilever Transport Division for internal purposes.

It will be made available to outside organisations through the Unilever film library. Running for 27 min., it is concerned with mechanical and pneumatic techniques of handling granular or powdery materials in the loose state. These include the conventional closed-circuit conveyor and bucket elevator, a self-discharging barge handling grain, the handling of an abrasive material, fluidising silos, and throughout movement from supplier to user by road and rail.

It is in this last respect that the film shows the value placed by the large industrial concern on the special-purpose railway wagon; designed in conjunction with the customer, this could speed up deliveries and result in profit to the railways and economy to the user.

Worth Valley railway threatened by closure

A statement circulated to the Press by General Sir Roy Bucher, Chairman of the Transport Users' Consultative Committee for the Yorkshire area, aims to dispel any feeling that may exist that the Transport Users' Consultative Committee "rubber-stamps" railway closure proposals; that railway officials adopt an unyielding attitude when submitting these cases, and that public authorities and others expect to retain a service irrespective of cost.

The statement outlines the case for and against the closure and reclaim of the Worth Valley railway, which runs for 4¾ miles of single track between Keighley and Oxenhope.

British Railways' case for closure is based on the low volume of passenger and freight traffic, the changes in travelling habits, and the rise of alternative means of transport. Throughout the discussions, the railway representatives have insisted that, whatever changes are made, the time is long past when the line can pay its direct costs, let alone make a contribution towards indirect costs. These arguments have been met with determined opposition by users, who have followed the advice of a former Mayor of Keighley and are making greater use of the railway.

In view of the local feeling, the railways have given the Worth Valley line a temporary reprieve and have replaced its steam service with an improved diesel service, have streamlined the staff, and have made certain modifications to fares. The line will continue to operate until June, 1961, when the results will be reviewed.

So that all members of the Transport Users' Consultative Committee may have full appreciation of all circumstances and factors involved in the matter, as well as a first-hand acquaintance with the district, a tour of inspection will be made on February 28. The party will travel to Oxenhope by train calling at all intermediate stations, and will return to Keighley by bus, visiting Haworth, Oakworth, Cross Roads and Ingrow.

Parliamentary Notes

Durham train services' complaints

Mr. Charles Grey (Durham—Lab.), on the adjournment of the House of Commons on February 14, protested against alterations in train services, which greatly affected Durham, being made on January 2, in spite of all the objections that had been lodged beforehand.

Mr. William Ainsley (Durham N.W.—Lab.) said that at one time the transport picture was that of a tree with branches spreading out in every direction, but to-day passenger facilities for travel to the west had been lopped off. It was time the structure of road and rail transport was examined.

Mr. John Hay, Joint Parliamentary Secretary, Ministry of Transport, said that the changes affected the areas of Newcastle, Durham, Sunderland, West Hartlepool, Stockton, and Darlington. Their object was to enable the railways to run fast diesel trains from Newcastle and Tees-side to Leeds and Liverpool.

The alteration was made necessary by the introduction by British Railways of the Trans-Pennine diesel service and the improvement of the inter-city service between Newcastle and Liverpool.

Such matters as the re-timing of trains, or the cutting-out of one train, would not normally be put to the transport users' consultative committees or to the local authorities. It had to be remembered that they were aiming at viability on the railways, and the general financial position of the railways always must be borne in mind. They were still losing a great deal of money, and the taxpayer was having to bear the burden of that loss. The Minister of Transport did not intend to interfere with the British Transport Commission's statutory responsibility for running the country's trains.

Edinburgh railway anomaly?

Lord Amulree, in a discussion in the House of Lords on February 16 on road traffic problems in and around Edinburgh, said that one of the great drawbacks of the city was the railway line through Princes Street Gardens.

The Earl of Haddington agreed with Lord Amulree about the railway, and wanted the surface space occupied by it reclaimed as a park and the space underground used as a parking place for 2,000 cars.

In the course of a debate initiated by Mr. C. Osborne (Louth—C.) on February 17, Mr. R. Sorensen (Leyton—Lab.) said that this country needed migrants from the West Indies and elsewhere.

Mr. Nigel Fisher (Surbiton—C.) said the British Transport Commission had been recruiting labour in Barbados. It was hard to see how our railways and hospitals could have been effectively carried on and adequately staffed over the last few years without West Indian immigration. Far from causing unemployment in this country, the West Indians have filled a labour shortage in many industries.

Questions in Parliament

Reconstruction of Barking Station

Mr. John Parker (Dagenham—Lab.) asked the Minister of Transport on February 15 when the reconstruction of Barking Station was likely to be completed.

Mr. Ernest Marples, in a written answer, stated this was likely during the summer.

Fenchurch-Southend electrification

Mr. John Parker also asked on February 15 what progress had been made with the electrification of the Fenchurch Street-Tilbury-Southend line.

Mr. Ernest Marples, in a written answer, stated that the scheme had made good progress and that it was hoped to begin the new services before the end of this year.

British Railways in Scotland

Mr. Hector Hughes (North Aberdeen—Lab.) asked the Minister of Transport on February 15, how far the capital development plans for the electrification of British Railways in Scotland had been developed and extended during the past six months, and if he would specify the districts affected.

Mr. Ernest Marples, in a written answer, stated he had received no proposals during the past six months from the British Transport Commission involving the development or extension of plans for railway electrification in Scotland. The Commission had informed him that it had no such changes in mind at present.

Mailbags on railways

Mr. Ellis Smith (Stoke-on-Trent S.—Lab.) asked the Postmaster General on February15, in view of the need to modernise methods of dealing with mailbags on railways, when he intended to install electrically-operated conveyors from the outside of stations direct to platforms.

Miss Mervyn Pike, Assistant Postmaster General, in a written answer, stated that these would be provided in favourable circumstances. Their introduction at a number of places was being considered.

Staff & Labour Matters

Claim for shorter working week

At a meeting in London on February 17 of the Railway Staff National Council, comprising representatives of the British Transport Commission and the three railway trade unions, the unions submitted claims for a shorter working week. The Commission promised to give the claims full consideration and to reply at an early date.

CONTRACTS AND TENDERS

British and overseas contracts for Plasser equipment

The North Eastern Region of British Railways has placed a contract with Plasser Railway Machinery (G.B.) Limited for two high-capacity spot tamper lifting and levelling machines of Plasser & Theurer, Type "HM 300 St," with accessories.

The East African Railways & Harbours has placed an order through the Crown Agents with Plasser Railway Machinery (G.B.) Limited, for the supply of one Plassermatic VKR-04 PX-10, levelling, lifting and tamping machine, and one Plasser & Theurer "VKR-03" super hydraulic tamper.

The Swiss Locomotive & Machine Works has received from the Manitou & Pikes Peak Railway, U.S.A., an order for two 80-seat diesel-electric rack railcars of 440 b.h.p. on site at the summit of 14,110 ft., and equipped with two S.L.M. underfloor air-cooled diesel engines and Brown Boveri electric transmission.

Mr. G. W. Chalk, Minister of Transport, Queensland, has placed a contract with Thiess Bros. Pty. Ltd. of Queensland, for the construction of a new railway bridge at a cost of £1,159,433 over the Burdekin River at Macrossan, near Charters Towers. The bridge will be 2,340 ft. long and 80 ft. above the river bed, which is more than 15 ft. higher than the maximum flood level. This work is part of the Townsville-Mount Isa reconstruction project.

The latest design of rubber suspension for subway cars by Metalastik, Limited, is to be fitted on 150 to 200 carriages for Stockholm Underground to be built by the A.S.J. Company, with ASEA, electrical equipment. The decision to adopt Metalastik springing was made after extensive trials in Sweden. In addition to axlebox and bolster springs, Metalastik will provide bonded rubber sidebearers and centre pivots.

BOARD OF TRADE

The Export Services Branch, Board of Trade, has received calls for tenders as follow:—

From South Africa :

940 stainless-steel sheets 18 per cent Cr. 8 per cent Ni. quality with carbon content not exceeding 0.08 per cent, bright finish both sides, equivalent to No. 4.A.1.S.1. finish and suitable for shallow pressing, in various sizes

200 ft. stainless-steel bar, 18 per cent. Cr. 8 per cent. Ni. quality with carbon content not exceeding 0.08 per cent, bright finish equivalent to No. 4.A.1.S.1. finish, ¾ in. dia.

The issuing authority is the Stores Department, South African Railways. Bids in sealed envelopes, endorsed "Tender No. H.8549 ; Stainless Steel Sheets and Bars" should be addressed to the Chairman of the Tender Board, P.O. Box 7784, Johannesburg. Local representation is essential. The closing date is March 17, 1961. The Board of Trade reference is ESB/4958/61.

From Pakistan :

4,000 padlocks, M.S. galvanised, 2½ in. x 4 in. levers with duplicate keys to PRSS No. H-9-49.

The issuing authority is the Chief Controller of Stores, Pakistan Eastern Railway, Pahartali, Chittagong, to whom bids should be sent. The tender No. is P2/GB1/270/61/ACST. The closing date is March 15, 1961. The Board of Trade reference is ESB/5544/61. No further information is available at the Board of Trade.

28,185 tie bars M.S. for C.I. sleepers CST/960 lb. rails M.G. as per drg. No. 1769/A and specn. No. PRST 8-49

4,000 side split M.S. cotters for C.I. sleepers CST/960 lb. rail M.G. as per drg. No. T-432 and specn. No. PRST 8-49

100,000 two-way keys for CST/9 sleepers 60 lb. rail M.G. as per drg. No. T 413 and specn. No. PRST 8-49

160 tie bars M.S. (long) for C.I. sleepers CST/9.90 lb. rail B.G. as per drg. No. T404 and specn. No. PRST 8-49

616 side split M.S. cotters for C.I. sleepers CST/9.90 lb. rail B.G. as per drg. No. T 401 and specn. No. PRST 8-49

308 two-way keys for CST/9 sleepers 90 lb. rail B.G. 7½ in. long as per drg. No. T504 and specn. No. PRST 8-49.

The issuing authority is the Chief Controller of Stores, P.E. Railway, Pahartali, Chittagong. The tender No. is E/D1/8/55/P11. The closing date is March 7, 1961. The Board of Trade reference is ESB/4935/61. No further information is available at the Board of Trade.

25 tons of mild steel flats, 1½ in. x ¼ in. to PRSS No. M-5-55 class 11.

The issuing authority is the Chief Controller of Stores, Pakistan Eastern Railway, Pahartali, Chittagong, to whom bids should be sent. The tender No. is P2/GB4/219/60/ACST. The closing date is March 25, 1961. The Board of Trade reference is ESB/5540/61.

From Ceylon:

Supply of asbestos cement sheets.

The issuing authority is the Chairman, Tender Board, Ministry of Transport & Works, P.O. Box 547, Colombo, to whom bids should be sent. The closing date is March 8, 1961. The Board of Trade reference is ESB/5245/61. No further information about this call for tenders is available at the Board of Trade.

From Egypt :

Supply and installation of v.h.f. equipments for railways in U.A.R. Egyptian territory.

The issuing authority is the Ministry of Communications, Egyptian Territory Telecommunications Organisation. The tender No. is 32/61/302F. The closing date is June 7, 1961. General conditions and technical specifications can be obtained from the main Cash Office of the Opera Exchange at Ataba Square, Cairo, against payment of £E.10 plus 250 mms. for postage expenses.

The Board of Trade reference is ESB/5247/61. No further information about this call for tenders is available at the Board of Trade.

From Victoria :

50 or 100 impedance bonds.

The issuing authority is the Secretary, Victorian Railways, Melbourne, C.1, to whom bids should be sent. The tender No. is 61,876. The closing date is March 29, 1961. The Board of Trade reference is ESB/5271/61.

From Formosa :

12 outdoor distribution transformers, continuous rating, 150kVA single phase.

The issuing authority is the Central Trust of China, Purchasing Department, 68 Yen Ping Nan Road, Taipei, Taiwan, to whom bids should be sent. The tender No. is CP4D-1049. The closing date is March 21, 1961. The Board of Trade reference is ESB/5267/61/I.C.A.

From Sudan :

1 300/400—A. double-operator arc welding set.

The issuing authority is the Stores Department, Sudan Railways. Bids should be sent to the Controller of Stores, Atbara. The tender No. is 2333. The closing date is April 6, 1961. The Board of Trade reference is ESB/5223/61.

9 high-speed propeller fans 48 in. dia., each fitted with totally-enclosed electric motor 3·4 b.h.p. speed with about 560 r.p.m., suitable for operation on 415-V., three-phase 50 cycles a.c. supply.

The issuing authority is the Stores Department, Sudan Railways. Prices should be quoted on both f.o.b. and c.i.f. Port Sudan basis and tenders must be valid for two months from the closing date. The closing date is March 29, 1961. The Board of Trade reference is ESB/4955/61. No further information about this call for tenders is available at the Board of Trade.

Further details relating to the above tenders together with photo-copies of tender documents, unless otherwise stated, can be obtained from the Branch (Lacon House, Theobald's Road, W.C.1).

The General Manager & Chief Engineer, Railway Electrification (Ministry of Railways, Government of India), is calling for tenders for supply and erection of some 250 track km. of 25-kV. a.c. 50-cycle single-phase traction overhead equipment on six sections on the 5-ft. 6-in. broad gauge in the Sealdah Division of the Eastern Railway. For further information relating to this tender see the official notice on page 236.

NOTES AND NEWS

Royal Society of Arts lecture. On March 8, at 6 p.m., a paper on "Technical developments in the steel industry" will be read by Sir Andrew McCance, Chairman & Managing Director, Colvilles Limited, at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2.

Royal Society of Arts lecture. On March 22, at 6 p.m., a paper on "Economic and commercial aspects of the steel industry" will be read by Sir Robert Shone, Executive Member, Iron & Steel Board, at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2.

Vickers Limited dividends. Final dividends of Vickers Limited in respect of the year 1960 are 2½ per cent, less tax, on the preferred 5 per cent and 5 per cent preference stocks and £2 5s. 7·5d. net per £100 stock on the cumulative preference stock.

D. Napier & Son trading loss. The loss on the trading account of D. Napier & Son Ltd. for the year ended December 31, 1960, was £1,521,540. The subvention payment from the English Electric Co. Ltd. and certain of its subsidiaries amounted to £1,525,000. No ordinary dividend is to be paid.

Wagon Finance Corporation reduced profits. Group net profits of the Wagon Finance Corporation for 1960 were £215,035, against £317,963 for the previous year. The dividend is maintained at 4s. 3d. per £1 ordinary share.

English Electric ordinary dividend. The board of the English Electric Co. Ltd. recommends a final ordinary dividend of 7 per cent (1s. 4·8d. per £1 stock) in respect of the year ended December 31, 1960. An interim ordinary dividend of 3 per cent was paid in September.

Increase in docks traffic. Traffic at British Transport Docks rose last year by over 4½ million tons to nearly 50 million tons—an increase of 10 per cent compared with 1959. Imports at 28,431,000 tons were up by 16 per cent, while exports increased by 3 per cent to 21,165,000 tons. Iron ore imports continued to rise and, by the end of the year, had reached a total of 7,679,000 tons, more than 1,949,000 tons (34 per cent) greater than that of 1959.

British Trade Fair, Moscow, 1961. The Morgan Crucible group will be exhibiting its products at the British Trade Fair, Moscow, 1961. The Group will be represented by a new subsidiary company—Morganite Exports Limited. The three main exhibits displayed will be "Purox" Refractories, "Crusilite" heating elements, and "Morganite" and "Morganohm" resistors.

Rogart station to re-open as a halt. Rogart railway station, on the Inverness-Wick line, will be re-opened as a halt for passengers on March 6. The station was closed for passenger traffic in June, 1960, and handled only freight, but from March 6 the 6.40 a.m. and 4.35 p.m. trains from Inverness will call there at 9.7 a.m. and 7.4 p.m. respectively. The 7 a.m. train from Helmsdale and the 3.35 p.m. train from Wick, both for Inverness, will make request stops only at Rogart at 7.40 a.m. and 6.22 p.m. respectively. Passengers who intend joining these trains at Rogart should advise the signalman there 10 min. before the train is due. Passengers from the North wishing to alight at Rogart should tell the guard at Golspie, the previous stopping place.

Great Northern traffic dieselised. Traffic to and from the south on the Great Northern Line of the Eastern Region of British Railways, has been dieselised and the first train passed on January 16. This was not previously possible because some Southern Region bridges were not up to the axle-weights of Type "2" diesel locomotives. Steam stock from Hornsey was used until some Brush 1,365-h.p. diesels were exchanged with Great Eastern lightweight Sulzers, which comply with Southern restrictions. The effect on Hornsey Motive Power Depot will not be marked as the diesels will be serviced and stabled there.

British Railways cheap travel. Cheap mid-week tickets on British Railways at a discount of 25 per cent on ordinary second class return fares will be re-introduced on May 2, and will be obtainable throughout the holiday season until October 26. Railrover tickets, which give unlimited travel either throughout British Railways or in selected holiday areas, can be purchased for any seven consecutive days between March 1 and October 31. They are valid on all timetable and advertised excursion trains. The "All-Line" railrover ticket costs £16 second class and £24 first class. Two "Freedom of Scotland" tickets will be available this year for the first time.

Crewe Pupils & Apprentices Association dinner. The annual dinner of the Crewe Pupils & Apprentices Association will be held at Whitehall Court, London, S.W.1, on April 21, at 6.45 for 7.15 p.m. Mr. H. G. Ivatt will preside. The principal guest will be Mr. R. F. Hanks, Member of the British Transport Commission and Chairman of the Western Area Board. Dress will be dinner jacket or lounge suit. The price of tickets for past Crewe men and their guests is 35s., exclusive of wines, and for present Crewe men and their guests 20s. Members should apply as soon as possible to the Hon. Secretary, Mr. F. B. Roberts, *Engineering*, 36, Bedford Street, W.C.2.

Stewarts and Lloyds export demands lower. Although home demands remain good, export demands for most categories of Stewarts and Lloyds Limited tubes have declined, it is hoped only temporarily. Output of other iron and steel products has been maintained during the first three months of the current financial year. Announcing this at the annual meeting on February 8, the Chairman, Mr. A. G. Stewart, stated that unless trading improved, the current year's profits will be less than for the year ended October 1, 1960. Developments planned at Corby are to increase the works capacity by 450,000 tons of pig iron and 450,000 ingot tons of steel. Facilities are to be provided for rolling the additional steel into billets and slabs and hot rolled strip for sale. The final dividend for 1959-60 is 12 per cent.

New Wolf service branch at Newcastle. Wolf Electric Tools Limited branch at Newcastle-upon-Tyne has moved into larger premises at 94-96, Heaton Road. The enlarged service workshop includes 3,000-V. apparatus for testing Wolf double insulated tools. Tools requiring attention can be sent or taken to the branch, and a quotation can be given on the spot or by telephone and work put in hand. In emergencies a replacement may be loaned to customers whose machines are being serviced. Enquiries should be made to 94-96 Heaton Road, tel.: Newcastle-upon-Tyne 659053.

B.R. all-line staff competitions. Railwaymen and women in all parts of the country are preparing in their leisure time for a full programme of inter-regional competitions organised by British Railways Staff Association. The competitions, which are open to staff of all grades and their families, start with Association football, in which the final between the London Midland and Western Regions will take place on March 15 at Maidenhead. The year's programme of events includes cricket, swimming, tennis, table tennis, golf, bowls, angling, small bore rifle shooting, drama, and arts and crafts. Three international sporting fixtures have also been arranged with railway staff in Europe under the auspices of the Union Sportive Internationale des Cheminots. These include table tennis at Bled, Yugoslavia, on April 24-29, boxing at Magdeburg, East Germany, on August 6-13, and men's swimming at Blackpool on October 4-8.

English steel at the Leipzig Fair. The products of English Steel, the Corporation Limited, its subsidiaries, Taylor Bros. & Co. Ltd., and the Darlington Forge Limited, Darlington, and its associated company, Firth-Vickers Stainless Steels Limited, will be displayed on one stand at the Leipzig Fair on March 5–14. The English Steel Corporation will feature high-grade carbon and alloy steels (which can be manufactured to German, British and other recognised standards); high-speed steels; carbon and alloy-tool steels; and precision-ground, centreless-turned, and bright reeled bars. Other exhibits include drop forgings for the general engineering industries, torsion bars, engineers' cutting tools, and permanent magnets. Scale models of wheels and axles will be shown by Taylor Bros. & Co. Ltd. The company's larger products, which include one-piece cast-steel railway bogies, will be illustrated pictorially, with photographs of plant and production processes. Firth-Vickers Stainless Steels Limited will display stainless steel sheet and bars, and precision, shell-moulded, and static castings and centri-spinnings

Holiday training course. Westinghouse Brake & Signal Co. Ltd. has announced that a further "Introduction to Industry" train-

ing course will be held at its Chippenham Works during the Easter vacation, (April 10-14, 1961). This time it is for sixth form boys who will be taking G.C.E. "A" level examinations in scientific subjects in 1962. This course is designed to give boys at first hand a good insight into the engineering industry, how it works, the training facilities available and career prospects. Applications should be sent to the Personnel Superintendent, Westinghouse Brake & Signal Co. Ltd., Chippenham, Wiltshire, by March 1, 1961.

British tractors for Leipzig Trade Fair. Two 15-ton tractors never before seen in Eastern Europe are being shipped to Leipzig by Marshall, Sons & Co. Ltd. of Gainsborough, Lincolnshire, for the Spring Trade Fair, opening on March 5. The tractors are of 125 h.p. each and will be shipped from Dagenham to Hamburg and forwarded by road to East Germany. Marshall, Sons & Co. Ltd. is already doing considerable business with East Germany, and 80 tractors of 55 h.p. are now operating there. One of these smaller tractors will form a third exhibit at the Fair. The large tractors measure 8 ft. wide by 15 ft. long. One of them will have a fitted side boom crane, used for laying oil pipe lines.

Reconstruction of Central Line bridge. The London Transport Executive has announced that the Woodford-Hainault shuttle train service on the Central Line will be suspended for part of the day on six Sundays while work is in progress on the reconstruction of a bridge at Chigwell. The bridge carries the line over a private road leading from Luxborough Lane. The six Sundays on which the train service will be suspended are : February 26, March 5, April 9, 16 and 30 and May 7. Preliminary work has started and it will be necessary for trains to reduce speed at this point from February 26. Engineers will instal temporary supports for the tracks and cables, and concrete work on the bridge abutments and ballast walls will be carried out before the old bridge is dismantled and a new steel structure erected. Further concreting will then be done before the deck of the new bridge is waterproofed and ballasted to carry the twin tracks.

Minister of State to open Electrical Engineers Exhibition. Mr. Frederick Erroll, Minister of State, Board of Trade, will open the Tenth Electrical Engineers Exhibition at Earls Court on March 21. Before his appointment as Minister of State, Mr. Erroll, himself a qualified electrical engineer, was a director of several engineering and mining companies.

Automatic level crossing barrier. In an article on the automatically-operated level crossing barriers installed at Spath, British Railways, London Midland Region, in our February 10 issue, the information concerning operation in the event of main power supply, equipment, or track circuit failure was incorrect. In the event of a main power supply failure the equipment will function satisfactorily for at least 12 hr. from standby batteries automatically switched in. In the case of a failure of equipment or track circuit, the barriers will be lowered and all the traffic signals will flash. Only in the very unlikely event of a failure of the flasher relay would a steady light in each pair of traffic signals be illuminated, as originally stated. Mr. Brentnall's initials are E.G. and not S.G. as stated in the last paragraph of the article.

Revised British Standard for mild-steel drums. The new edition of B.S. 814: 1961 gives much closer tolerances for light-duty steel drums with fixed ends than did the previous edition. This has been made possible by introduction of new manufacturing equipment and will facilitate use of the international sizes of pallets with these drums. Two of the capacities specified in the last edition, 12 gal. and 12½ gal., have been omitted, because their use has declined. A new class of drum of 46 Imperial gal. rated capacity has been introduced at the request of exporters. Copies may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1, price 5s.

Revised British Standard. A new, 68-page edition of B.S.162 (Electrical power switchgear and associated apparatus) which replaces the 37-page edition published in 1938, brings up to date the requirements for electrical power switchgear and associated apparatus for use at voltages greater than 100 V. for d.c. and for a.c. at power frequencies. It is not intended to replace the individual British Standards for specific apparatus; its function is to cover general requirements when different types of switchgear and associated apparatus are assembled together. The general design and construction of different types of switchgear are dealt with and there are sections relating to control, metering, and relay equipment and compressed-air auxiliary systems. Emphasis is laid on matters relating to safety of personnel and apparatus, and clearances, safety clearances, work sections, and earthing are dealt with in detail. Clauses are amplified by 23 pages of appendices, which include five diagrams illustrating the principles involved in applying safety clearances in switching station design. Enlargements of these drawings are available. Copies of the standard may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price of B.S.162, 17s. 6d., and price of B.S.162C (set of drawings), 30s. each. (Postage extra for non-subscribers).

WESTERN REGION PUBLICITY

Three new season's posters produced by the Public Relations & Publicity Department, British Railways, Western Region

Railway Stock Market

Stock markets have maintained a much brighter appearance, and although demand was selective, the general trend in industrial shares has been higher. Take-over moves and rumours again produced some especially strong features. A better trend in British Funds earlier in the week appeared to reflect continued hopes of an early reduction in Bank rate.

Foreign Rails recorded few movements. Antofagasta ordinary at 16½ and the preference stock at 36 were virtually the same as a week ago. Costa Rica ordinary changed hands up to 42, and business down to 51 was shown in Chilean Northern first debentures. Paraguay Central prior debentures have been dealt in at 17, while Brazil Railway bonds transferred down to 4½. United of Havana second income stock remained at 6¼, Sao Paulo Railway 3s. units at 10½d., and Guayaquil & Quito assented bonds at 50. Mexican Central 'A' bearer debentures eased from 60 to 59½. International of Central America common shares were $18½, but the quotation was apparently not tested by business. Midi Railway 4 per cent sterling bonds remained at 85½.

Canadian Pacifics eased from $41⅜ to $41 at which there is a yield of 6⅝ per cent on the basis of last year's $1·5 dividend. The 4 per cent preference stock rallied from 55¾ to 57¼, but the 4 per cent debentures were 57⅜, compared with 58¼ a week ago. White Pass shares remained at $10½.

Nyasaland Railways shares were dealt in up to 10s. 6d. and Emu Bay 5 per cent debentures at 28. Midland of Western Australia ordinary stock marked 7½.

In the locomotive building and engineering section, share values were uncertain with Birmingham Wagon reacting afresh from 27s. 6d. a week ago to 23s. on further consideration of the chairman's recent statement on the set-back which will prevent a dividend on the ordinary shares. Moreover, Gloucester Wagon 10s. shares came back from 10s. 9d. to par, though Wagon Repairs 5s. shares held steady at 19s. 9d. and G. D. Peters were dealt in up to 20s. 4½d. On the other hand, Beyer Peacock 5s. shares eased slightly to 7s. 1½d. A rally from 7s. to 8s. 3d. was recorded by Charles Roberts 5s. shares.

Recently there has been a revival of vague rumours of mergers or link-ups and of further plans for diversification of interests by companies in the industry, but the rumours were unconfirmed. North British Loco. shares were 6s. 3d., compared with 6s. 6d. a week ago.

Stone-Platt at 62s. 3d. compared with 64s., lost part of their recent good rise, though on the other hand T. W. Ward were strong, advancing on balance from 71s. to 74s. and Metal Industries rose further from 62s. 9d. to 63s. 3d. In the boiler section, Babcock & Wilcox improved to 31s. 9d. and Hopkinsons to 112s. 6d. but Clarke Chapman remained at 43s. 9d. A feature has been an advance in Mather & Platt ordinary stock to 52s. 3d. from 48s. 6d. a week ago.

English Electric rallied following the results and maintained 10 per cent dividend, the fall in profits being smaller than expected bearing in mind that 1960 was a difficult year; the shares at 34s. were, however, slightly lower compared with a week ago. A.E.I. have come back from 41s. to 40s. 3d. and G.E.C. from 32s. 3d. to 31s. 3d. In machine tools, Alfred Herbert were up to 64s. from 61s. 6d. a week ago, in response to the increased profits and raising of the tax free dividend from 7 per cent to 8½ per cent.

Leyland Motors were 79s. 6d., Dowty Group 10s. shares rose afresh from 36s. 9d. to 37s. and Pressed Steel 5s. shares at 30s. 6d. held nearly all their recent rise. Pollards Bearing 4s. shares rose further from 34s. 9d. to 35s. 3d. while British Oxygen 5s. shares at 30s. 3d. reflected the statements at the recent annual meeting and the scrip issue news.

Forthcoming Meetings

February 24 (*Fri.*). The South Wales & Monmouthshire Railways & Docks Lecture & Debating Society, at Swansea, "How much art in advertising?" Mr. H. D. Muirhead.

February 27 (*Mon.*). The Institution of Railway Signal Engineers, Bristol Branch, at Bristol Temple Meads Station, Bristol, at 6 p.m. "Tokenless block working," Mr. V. S. King.

February 28 (*Tue.*). The Institution of Civil Engineers, Great George Street, S.W.1, at 5.30 p.m. "Some experience with prestressed concrete piles," Mr. S. V. Gardner and Mr. D. H. New.

March 1 (*Wed.*). The Electric Railway Society, at the Fred Tallant Hall, 153 Drummond Street, N.W.1, at 7 p.m. "When troubles abound underground," Mr. A. T. Gorton.

March 1 (*Wed.*). The Institution of Railway Signal Engineers, Glasgow Branch, at the St. Enoch Hotel, St. Enoch Square, Glasgow, C.1, at 7.30 p.m. "Experience with the British Railways standard electrification system, with particular reference to signalling and telecommunications," Mr. A. W. Woodbridge.

March 1 (*Wed.*). The Peterborough Railway Discussion Group, at Peterborough Technical College, Eastfield Road, at 6.45 p.m. "Railways—the next 30 years," Mr. C. Hamilton Ellis.

March 2 (*Thu.*). The Institute of Transport, South Eastern Group, at the County Hotel, Canterbury, at 7.15 p.m. Annual Dinner.

March 2 (*Thu.*). The Institute of Transport, Scottish Section, at the Central Hotel, Glasgow, at 6.30 p.m. Annual Dinner and visit of President.

March 3 (*Fri.*). The Institute of Transport, Tees-side Section, at Highfield Hotel, Middlesbrough, at 7.30 p.m. Annual Dinner and visit of President.

March 3 (*Fri.*). The Railway Club, at the Royal Scottish Corporation, Fetter Lane, London, E.C.4, at 7 p.m. Presidential Address.

OFFICIAL NOTICES

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(vi) Sonarpur Jn. (excl)-Canning

2. Tender Papers containing Instructions to Tenderers, Conditions of Tendering, Conditions of Contract and Specifications may be purchased from the office of the General Manager & Chief Engineer, Railway Electrification, 235 Lower Circular Road, Calcutta-20, on and from the 15th March, 1961, on payment of Rs.100/-(£7 10s.) per copy which shall be deposited in cash with the Cashier, Railway Electrification, 232 Lower Circular Road, Calcutta-20, or sent by money order to the above-named official.

3. Tenders shall be submitted in 7 copies in accordance with the instructions given in the Tender Papers to the office of the General Manager & Chief Engineer, Railway Electrification at or before 15.00 hrs. on July 15, 1961.

4. The earnest money to be deposited is rupees twenty thousand (£1,500). All relevant particulars are available in the Tender Papers, but any clarification required will be given by the General Manager & Chief Engineer, Railway Electrification.

5. Tenders will be opened at 15.30 hrs. on July 15, 1961, in the presence of Tenderers, if any, at the office of the General Manager & Chief Engineer, Railway Electrification.

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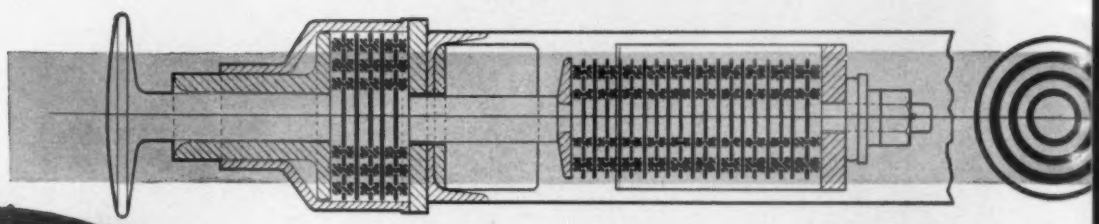

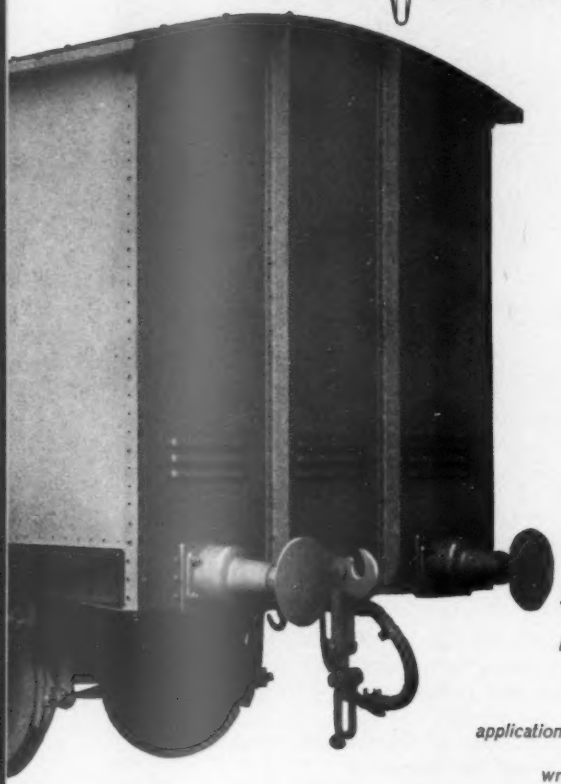

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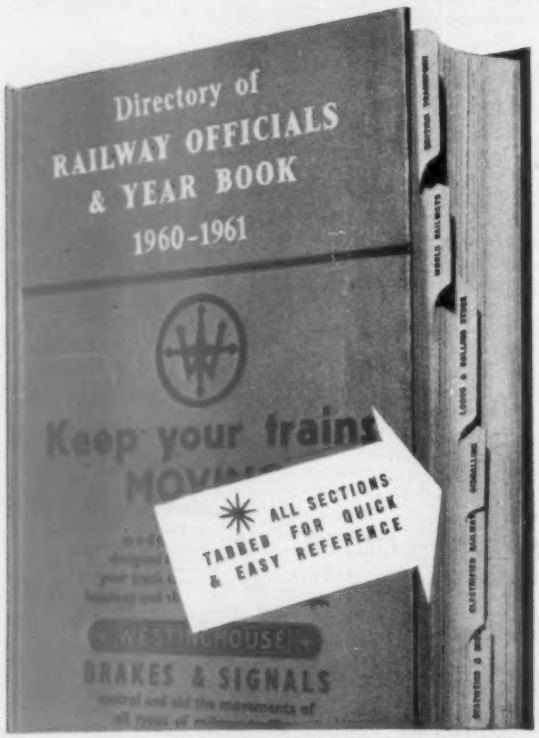

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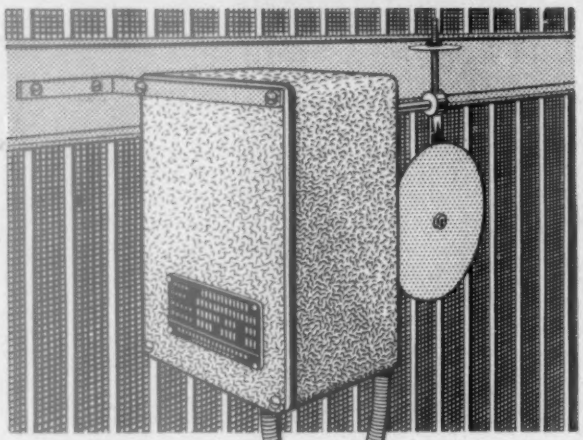

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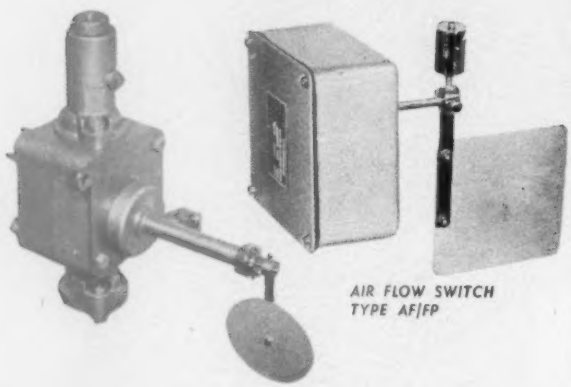

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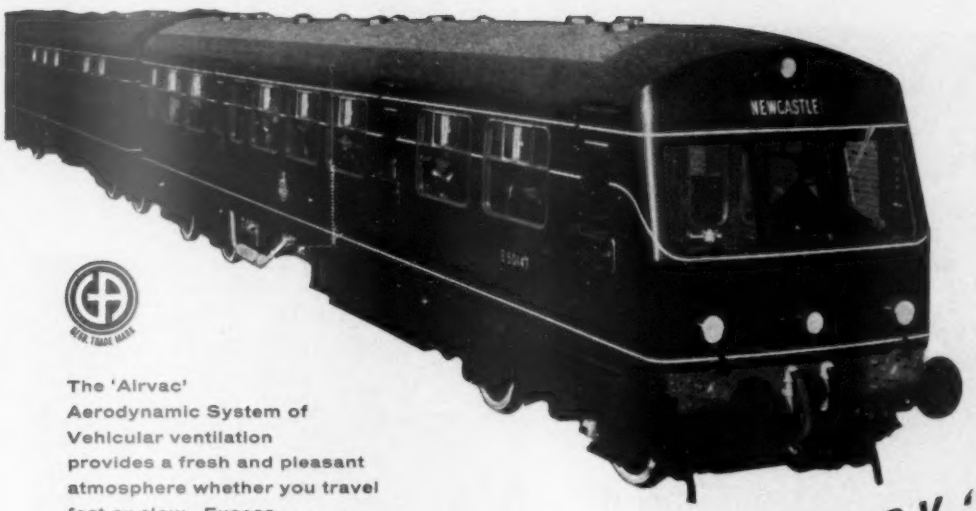

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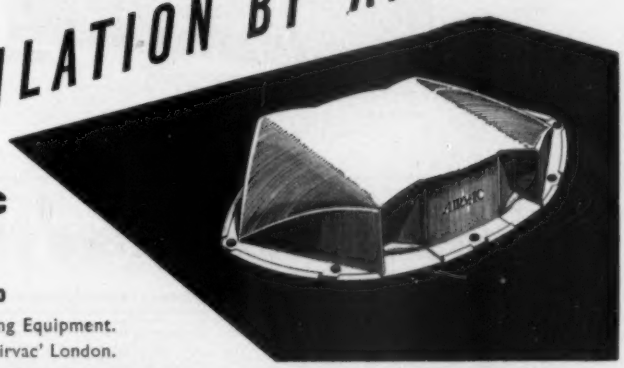

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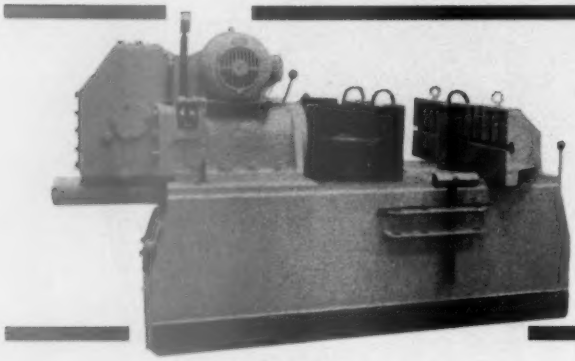

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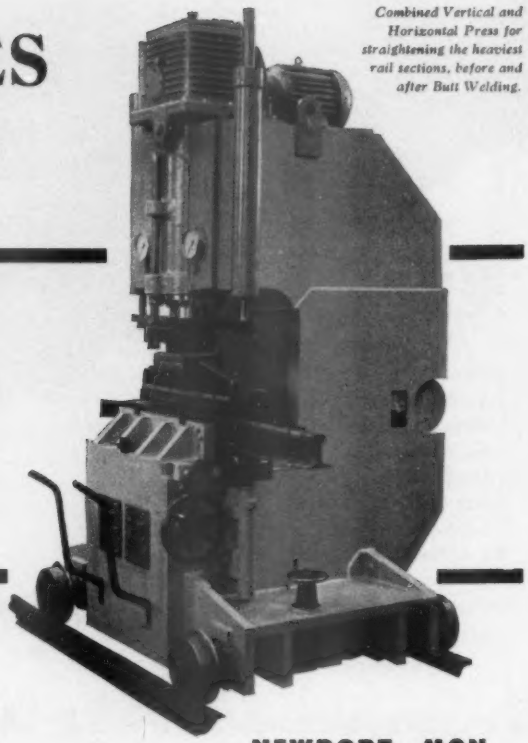

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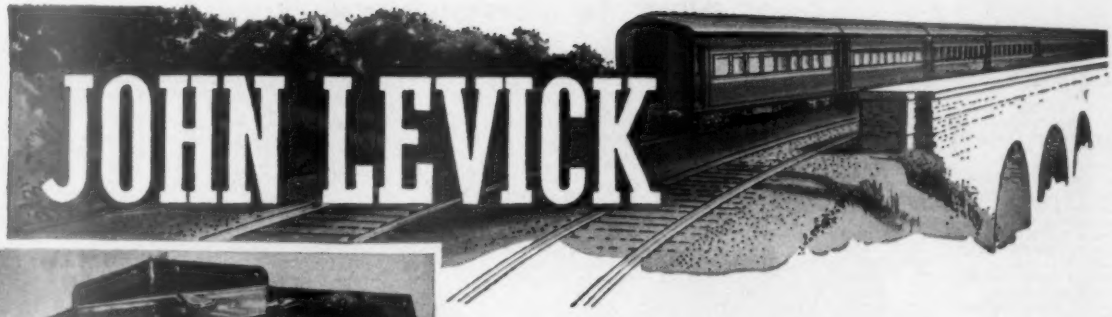

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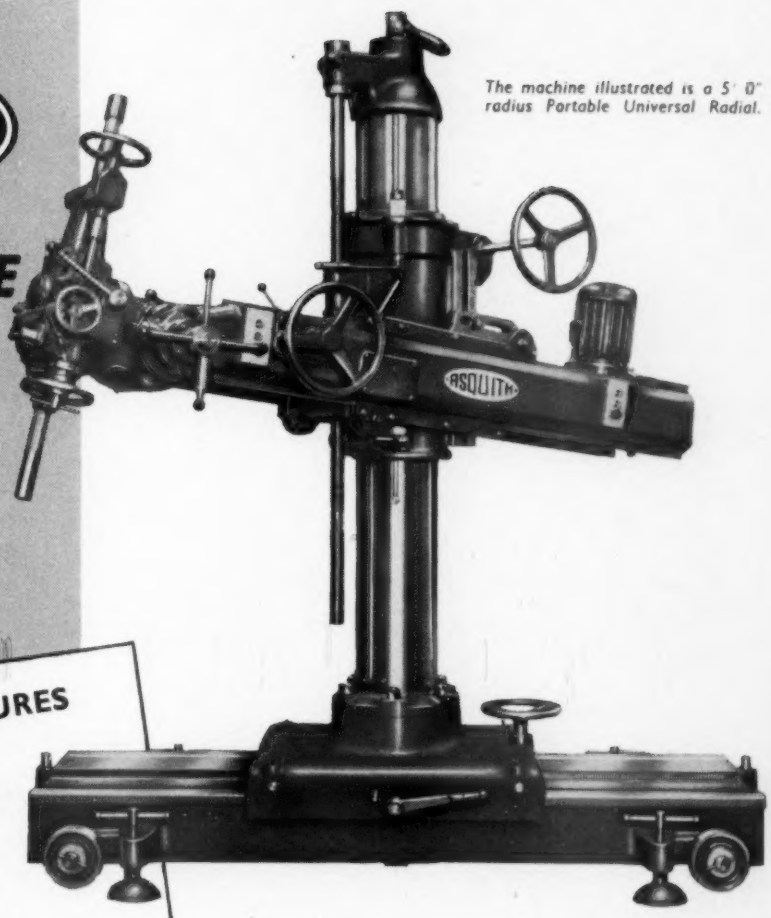

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